INDIA RUBBER WORLD

OUR 62nd YEAR

A BILL BROTHERS PUBLICATION

AUGUST, 1951

For easier processing GR-I stocks

USE DU PONT POLYAC

a stiffening agent and activator

WITH POLYAC it is possible to maintain constant plasticity over a wide temperature range or to actually increase the stiffness of GR-I stocks. Thus, the tendency of GR-I inner tubes to thin out at the splice is reduced . . . cold flow of uncured slabs is minimized . . . handling is made easier. In addition, there's the advantage of Polyac activation. With thiuram acceleration, for instance, Polyac imparts high modulus and low set. And, hot tear is greatly improved over that obtained with conventional activation.

For more information on processing techniques using Polyac in GR-I stocks, see Report BL-177, "Polyac in GR-I Inner Tubes" and BL-233, "Polyac as a Stiffening Agent for GR-I." Extra copies are available. Ask your Du Pont representative or write: E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division, Wilmington, Delaware.

HAVE YOU TRIED POLYAC NL ACCELERATOR FOR NEOPRENE LATEX?

POLYAC NL can be readily dispersed by ball milling for easy addition to neoprene latex compounds. It gives fast cures alone, or it can be used as an activator for thiazole or dithiocarbamate accelerators.

For more information on the use of Polyac NL in neoprene latex, see Report BL-194, "Polyac, Accelerator for Neoprene from Latex Compositions."

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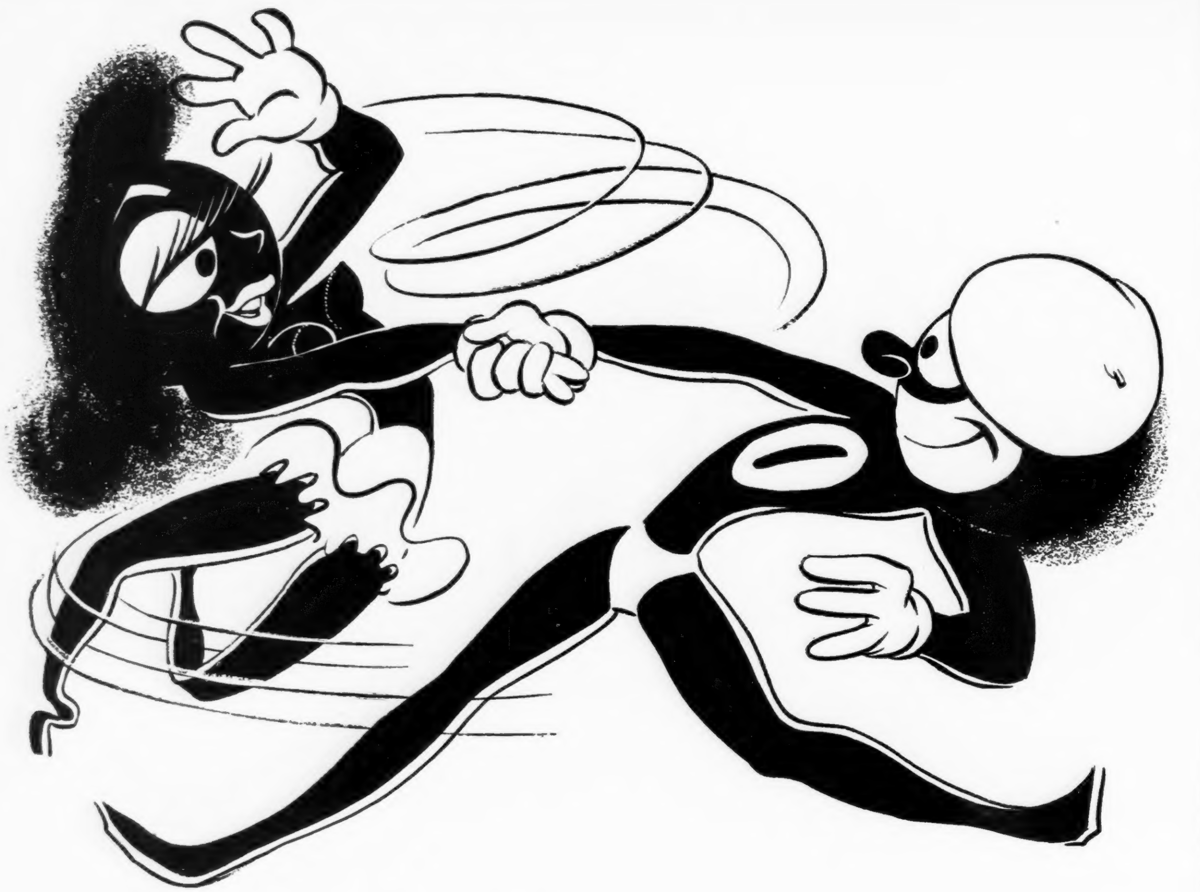
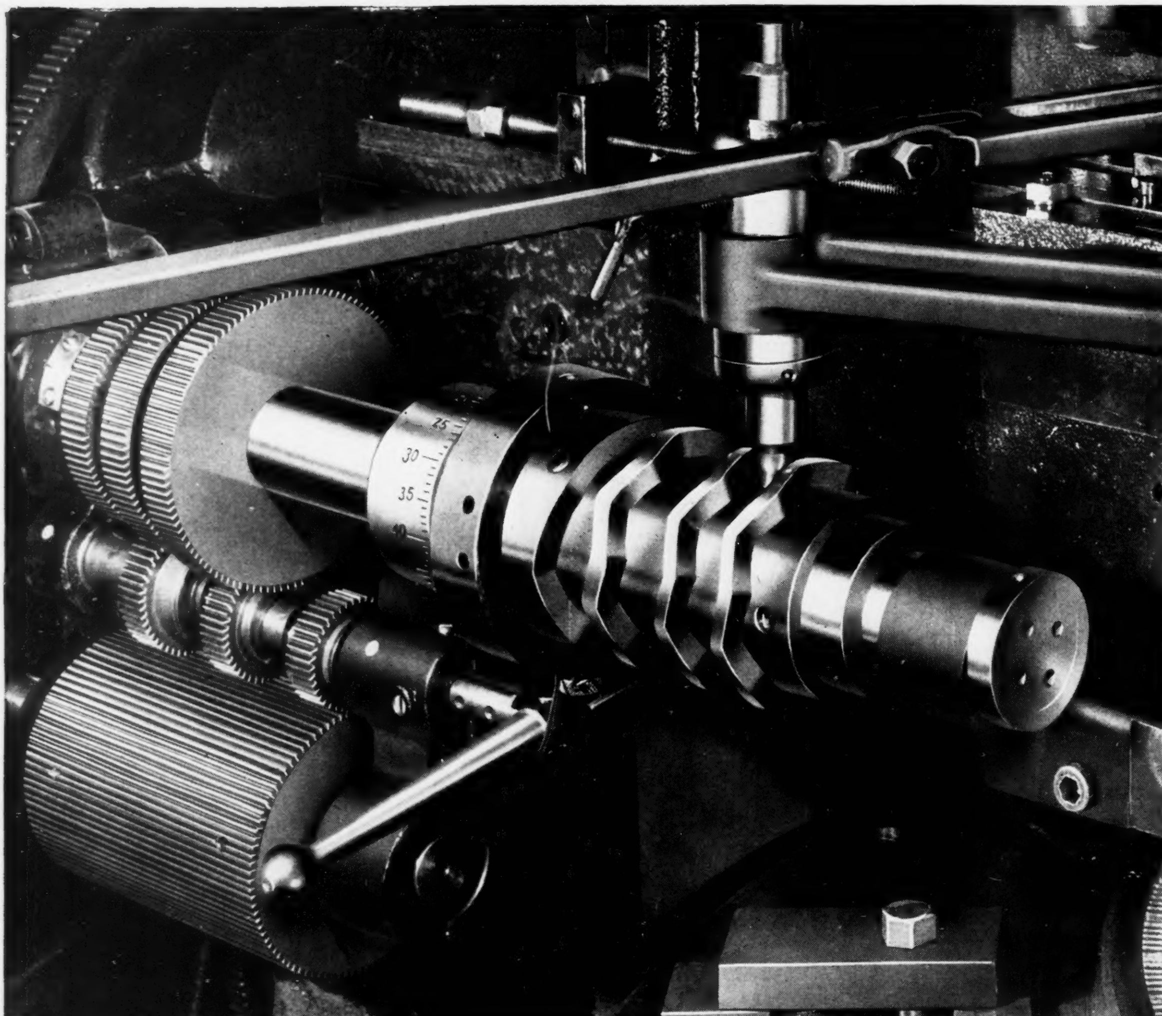
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

INDIA RUBBER WORLD, August, 1951, Vol. 124, No. 5. Published Monthly by BILL BROTHERS PUBLISHING CORP., Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription United States and Mexico, $3.00 per year; Canada $4.00; All Other Countries $5.00; Single Copies 35 Cents. Address Mail to N.Y. Office.

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Your GR-S 26 is protected with *Wing-Stay S*

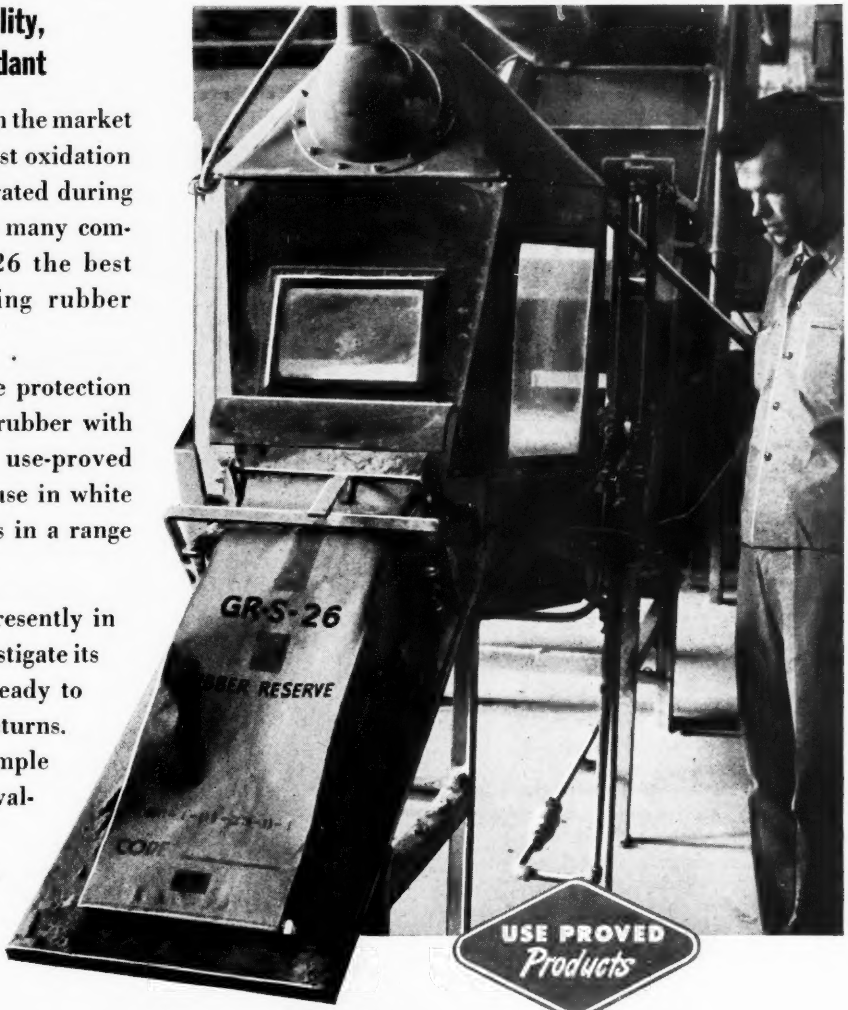
Goodyear's Top Quality, Nonstaining Antioxidant

EVERY pound of GR-S 26 on the market today is protected against oxidation with WING-STAY S—incorporated during manufacture. That's why so many compounders consider GR-S 26 the best nonstaining, non-discoloring rubber available today.

You can get equally effective protection in solid or foamed natural rubber with WING-STAY S—Goodyear's use-proved antioxidant that is in wide use in white and light-colored compounds in a range of products.

Although WING-STAY S is presently in short supply, you should investigate its potentialities *now*—and be ready to use it when normal supply returns. You can get full details and sample for your laboratory use and evaluation by writing:

GOODYEAR, CHEMICAL DIVISION,
AKRON 16, OHIO



GOODYEAR

Wing-Stay—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

RUBBER & PLASTICS MACHINERY BULLETIN

Reporting News and Machine Design Developments

IN BUSINESS TO NRM REDUCE YOUR COSTS

Extruder Specifications Available

Specification bulletins on all sizes of NRM Rubber Extruders, 2½" through 12", are now available.

For copies of bulletins, specify sizes of extruders in which you are interested, and write Rubber Machinery Division, National Rubber Machinery Company, Akron 8, O.

Specifications cover Extruder construction, screw speeds, recommended motor drive, and include piping and floor plan drawings.

New MIL-X-TRUDER eliminates warm-up mill

A new development from the NRM laboratories permits recirculation of stock in the Mil-X-Truder, eliminating the additional milling formerly done on the warm-up mill. Elimination of the warm-up mill and labor for its operation, and reduction of maintenance and floor space requirements will materially reduce extrusion costs.

Stock can be fed to the Mil-X-Truder in the form of pelletized stock, stripped direct from the roll-out mill, or strip-fed at room temperature, with equally satisfactory results.

Many materials difficult to extrude such as Silastic compounds can now be fed hot or cold to a Mil-X-Truder. Commercial accuracy can be maintained on sticky materials and asbestos loaded materials. Neoprene, Buna and Butyl are brought into the class of standard extrusions by this equipment.

MANPOWER SAVED WITH AUTOMATIC BIAS CUTTER CONTROLS

No operator needed in band-building set-ups for different ply widths

With the use of NRM's fully automatic bias cutter controls, no operator is needed in band-building set-ups, which require cutting one width for a period of time, then changing to another width for a similar period.

Manual operation can be used where desired for abnormal conditions, and service personnel can check the cutter occasionally. However, the cutter will operate as long as the cut stock is being removed from the bias cutter table. An auxiliary device accurately positions the stock in line with the splicing take-off for maximum splicing efficiency.

Ply widths are gaged and controlled directly by two photo-electric cells, mounted on the cutter bar. The width being cut is indicated on a large, easily read scale. Handwheel adjustment of ply width can be made from either side of the cutter.

A control station mounted on the side of the cutter provides for complete control of all electrical equipment: cutter motor, and let-off motor. A main control panel houses the control elements.

The table is driven by a special motor.

CUTTING SPEEDS

Range of ply widths	Max. cuts per minute
10" to 24"	20
24" to 36"	18
36" to 48"	15

The handwheel normally used for final determination of width is equipped with a clutch to permit disengaging the handwheel for automatic operation.

Your present cutters can be converted for fully automatic operation by the addition of NRM's electronic equipment, a knurled table drive roll with integral drive sprockets, a self-leveling high festoon, and separating rolls to open a space between plies for photocell operation.

Angles from 45° to 90°, and ply widths from 10" to 48" are permitted with the standard arrangement. Greater widths can be accommodated with less angle adjustment.

SZEGVARI ATTRITOR REDUCES COSTS; HAS REVOLUTIONIZED GRINDING PROCESSES

The Szegvari Attritor was developed by pioneers in latex processing. This new fine grinding machine makes conventional equipment obsolete—both by production and mechanical operation standards. Unlike conventional grinders, the Attritor has a stationary grinding tank instead of bulky rotating cylinders. Grinding elements and charge are intimately mixed together and exposed to controlled agitation by an especially designed agitator.

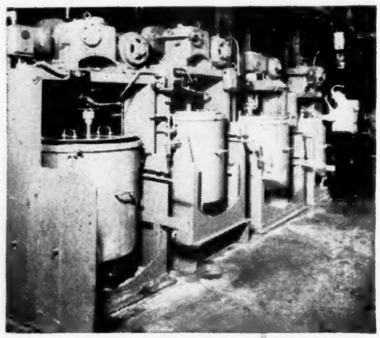


Photo: Courtesy American Anode, Inc.

Szegvari Attritors are built by NRM for the Union Process Co., Akron, Ohio—Specialists in grinding equipment. This battery of four Attritors has been in operation over a period of years grinding almost all ingredients used in rubber processing—including vulcanizing agents, color pigments, etc.

The Szegvari Attritor is small, but output is large. An Attritor requiring floor space of only 55" x 77" can produce as much as 20 times faster, with finer size, than conventional grinders. No elaborate mountings or foundations are necessary.

Greater safety in grinding hazardous material is another Attritor "plus". Reason: The volume of active grind in the Attritor is small and there is *no mechanical action in the air space* above the grind. Also a jacketed tank gives accurate temperature control. Rapid charging and discharging of the Attritor is achieved by a built-in pumping system.

NATIONAL RUBBER MACHINERY CO. General Offices & Engineering Laboratories Akron 8, Ohio

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96 Wall Street, New York 5, N. Y.

Creative Engineering


Here is one reason why
PROCESSING IS MORE EFFICIENT TODAY
That reason is the Banbury mixer—the machine you see in so many modern, up-to-the-minute processing layouts. And the reason why you see the Banbury so often is because its design has never been allowed to grow old.
Methods of installing Banburys have been developed which make it possible practically to eliminate the manual handling of stock to and from auxiliary equipment. Improvements in operating techniques and in the design of the machine itself have made the production of successive batches more and more uniform. With the addition of control equipment, such as a timing device, temperature recorder and discharge mechanism, each operation in the mixing procedure can be accurately controlled and an even flow of production assured.
The complete story of the latest Banbury developments is contained in a new 32-page publication, "BANBURY MIXERS," Bulletin 189. Send for a copy today—no cost or obligation.
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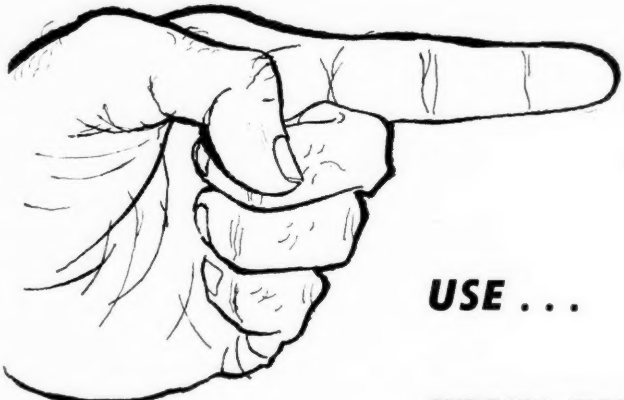
wire and cable compounds



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BURGESS PIGMENT NO. 30

(U. S. Pat. 2307239) An anhydrous kaolintype clay for compounding vinyl insulating compounds. Reinforcing agent and filler in synthetic rubber compounds. Yields excellent processing characteristics and high insulation resistance values in vinyl electrical compounds. High degree of uniformity with respect to specific resistance, color, and brightness.

MORFLEX NO. 100 (DIOP)*

New octyl phthalate-type plasticizer characterized by extreme stability, excellent heat aging resistance, low migration, retention of light transmission and superior electrical quality.

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New octyl sebacate-type plasticizers characterized by excellent heat aging resistance, retention of light transmission, and superior electrical quality.

**(Manufactured by Morton-Withers Chemical Co., Greensboro, N. C.)*
Write for samples and technical data.

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Increased consumer acceptance of supported and unsupported vinyl upholstery attests the desirability of attractive whites and soft pastels.

In vinyl upholstery TITANOX rutile or anatase titanium dioxides impart exceptional whiteness, brightness and opacity, and their compatibility with all types of synthetic or natural polymers helps maintain natural strength.

TITANOX-A, anatase type, is suggested where whiteness is of paramount interest. TITANOX-RA—the rutile type—is recommended for outstanding whiteness at low loadings. In heavily loaded stocks and in many tints, where the tinting strength of the pure oxides is not required, the rutile-calcium pigment—TITANOX-RCHT—may be used. All TITANOX pigments maintain bright, clean tints and their fine and uniform particle size affords easy mixing and grinding for complete dispersion throughout the polymer.

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Do your rubber products have the sniff that **sells?**

Use Du Pont "**Alamask**" odorants
TRADE MARK

Give your rubber products more customer appeal with "Alamask" odorants! Often times, it's the sniff that *sells*.

Here are some specific—and successful—end uses for new "Alamask" odorants: For rug underlays (natural and synthetic, open or closed cell structure): "Alamask" LD, "Alamask" 6390, "Alamask" O. For blown natural-sponge pillow and mattress stock: "Alamask" O. For shoe adhesives, from natural latex: "Alamask" ND, from synthetic latex: "Alamask" 6337, "Alamask" 175. For rug backings: "Alamask" LD, "Alamask" ND. For natural smoke sheets: "Alamask" O.

Du Pont "**Alamask**" odorants
TRADE MARK

Find out more! Send for the booklet "Odorants for the Rubber Industry"—or ask us for specific recommendations for your individual problems. Write—E. I. du Pont de Nemours & Co. (Inc.), Organic Chemicals Department, Aromatics Section, Wilmington 98, Delaware. Branch Offices: Atlanta, Boston, Charlotte, Chicago, New York, Philadelphia, Providence, San Francisco.

DU PONT
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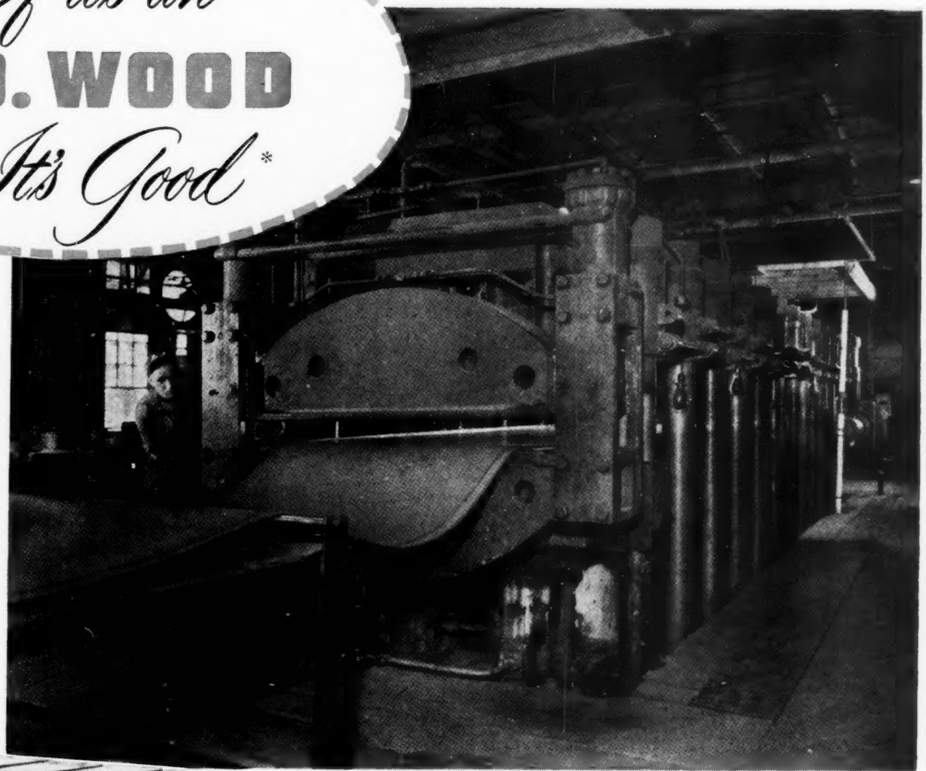
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

If it's an

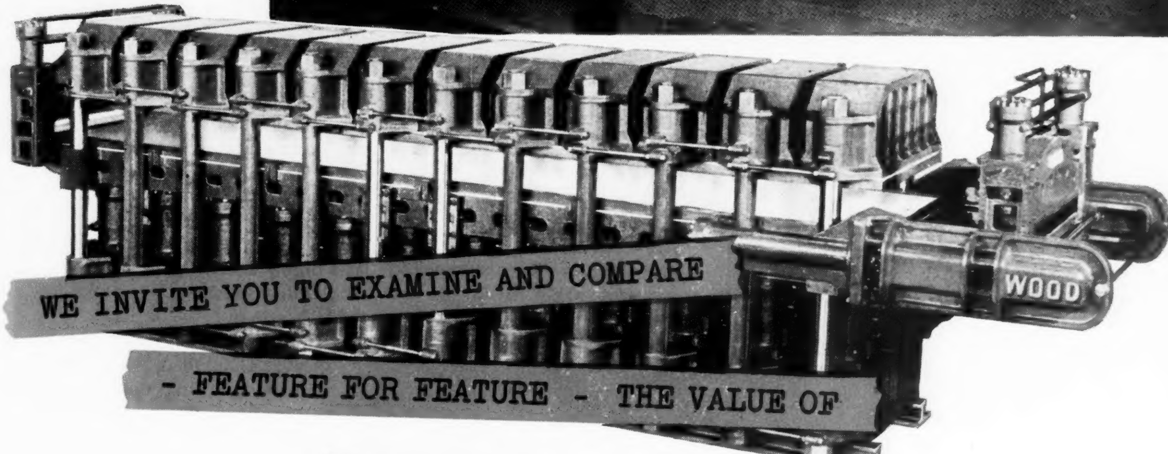
R. D. WOOD

*...It's Good**



3,180-ton single opening hydraulic belt press used for vulcanizing rubber belting. Twenty-four cylinders are arranged in pairs which can be cut out at any time, or can be removed from the press without dismantling any other part.

Hydraulic stretcher and clamping units are mounted at the ends of the moving platen which measures 63¼'' x 30' x 3¾''.



HYDRAULIC PRESSES AND
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R. D. WOOD COMPANY

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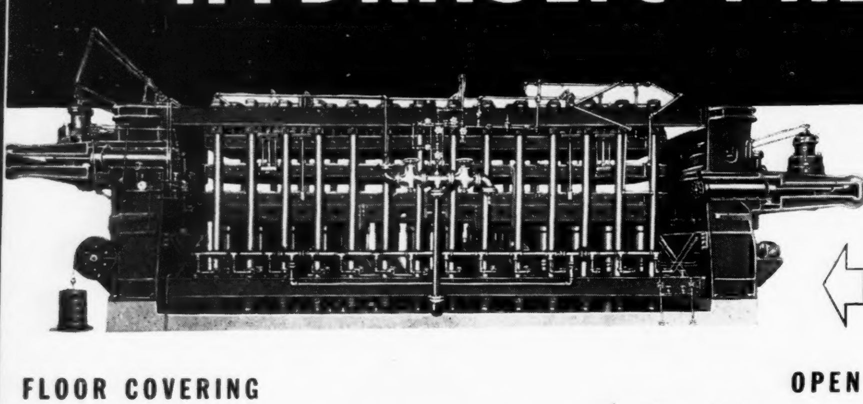
Established 1803

RDW WOOD

* FIND OUT WHY. SEND FOR YOUR FREE COPY OF OUR NEW PHOTOGRAPHIC BOOK OF PLANT FACILITIES.

ADAMSON UNITED HYDRAULIC PRESSES

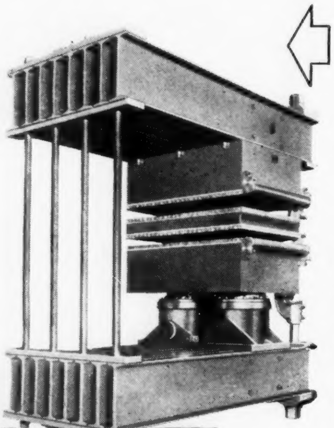


TWO-OPENING

This press has two openings permitting two lengths of belting up to 60 inches in width running in opposite directions, to be cured simultaneously. It is equipped with polished platens 63 inches wide by 31 feet long. Twenty-eight rams provide pressure during the curing operation. Proper belt tension is maintained by

FLOOR COVERING PRESS

A three-opening 42" x 126" Rod-type Press with three 22" hydraulic rams. The head, platens and bolsters are continuous the full length of the press. Just the press for your floor tile and runners. Flooring may be cured in molds, or between flat, sandwich plates. A prime characteristic of this press is its versatility. Addition of stretchers makes it adaptable to belt curing,—or, cut apart, it becomes three separate 42" square presses.



OPEN-SIDE BELT PRESS

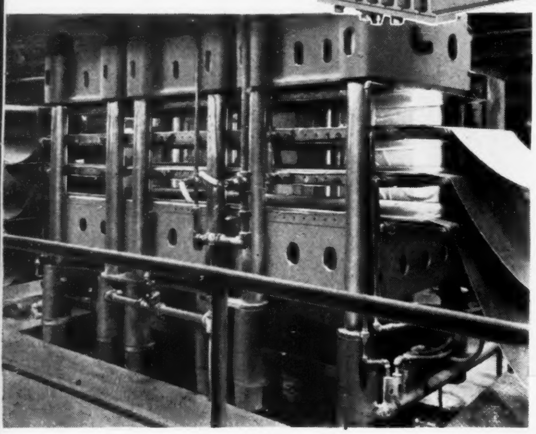
Through the use of structural beams for the head and base, with strain rods, this heavy-duty unit is desirable for the larger, more powerful open-side presses. Cold ends are built into 50" x 42" platens. The intermediate platens are held horizontal by four heavy guides traveling on turned and ground strain rods. The press is powered by two 20" rams. Excellent for curing "V" and flat belts.

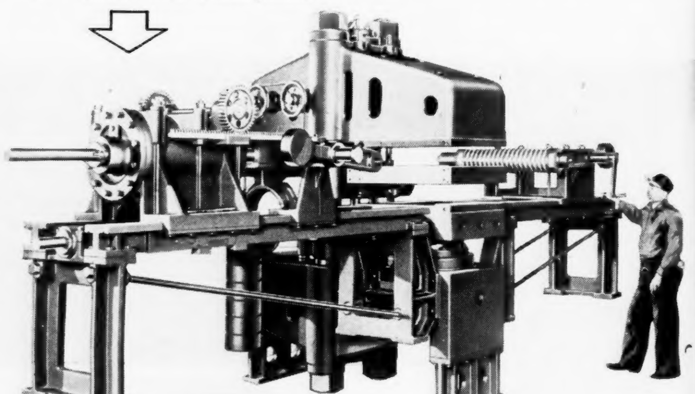
One of the most important uses of the Press is the curing of endless belts. Endless belts can be put into and taken out of the Press very easily.

30" x 36" OPEN-SIDE BELT CURING PRESS FOR FLAT OR V-BELTS

Complete with adjustable hydraulic stretcher, this press was designed and built for one of the industry's largest belt manufacturers. All platens are equipped with built-in cold ends. Intermediate platen with counterweights, is accurately suspended and guided on ground strain rods. Overhead push-back is provided for intermediate platens and bolster. Platens are chromium plated for flat belt curing.

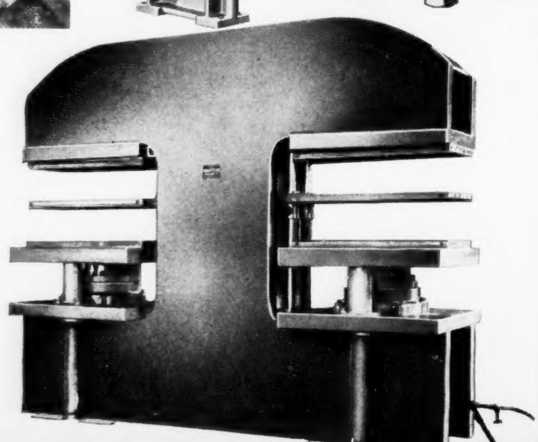
Stretcher rolls are made up of steel cores and shells of aluminum grooved to the proper contour for the belts involved. Aluminum roller shells are interchangeable.





DUPLEX PRESS FOR CURING "V" TRANSMISSION BELTS

The flat belts cured on this type of press are used in all kinds of agricultural machinery and wherever flat pulleys must be driven. It is a rugged, easily accessible, economical press with fabricated steel plate housing. It is equipped with spring-loaded pull-backs for the bolster. Intermediate platen is suspended in a manner that assures operator perfect parallelism of top and bottom platens. This press is indicated where pressures are comparatively low, and is ideal for curing "V" belts, etc. Manually or hydraulically operated belt stretcher equipment is available.



ADAMSON UNITED PRODUCTS

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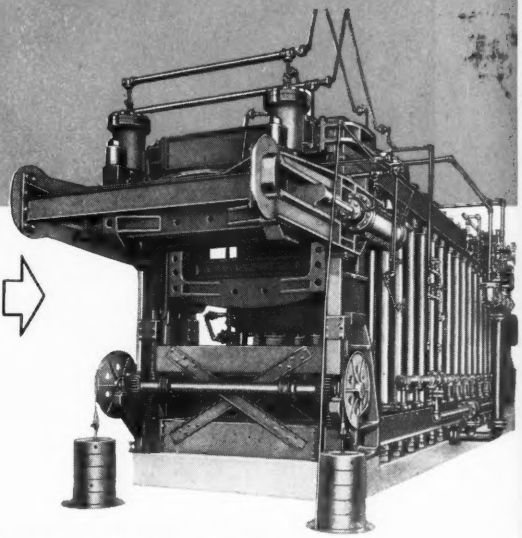
FOR ENDLESS FLAT BELTS AND ENDLESS V-BELTS

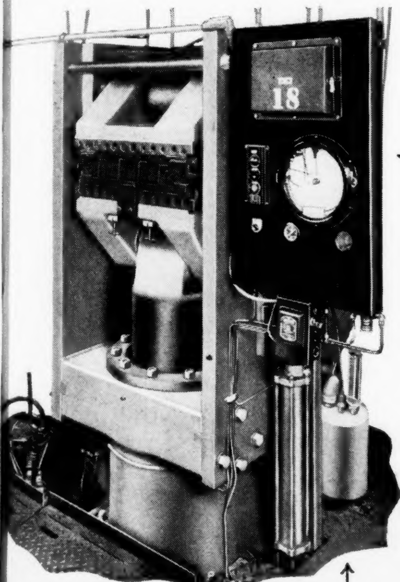
Our latest catalog of Hydraulic Presses for the Rubber, Plastics and Plywood industries, is ready for distribution. It describes and illustrates many types of Presses not shown in this advertisement. Send for it. You'll find it interesting.



BELT CURING PRESS

means of a clamp at one end and a stretcher at the other. These are mounted on separate stands rigidly braced by heavy compression members which extend the full length of the press. The clamp holds the belt while the stretcher is hydraulically pushed away from the press to give the belt the required stretch.

An exclusive Adamson United feature is the means of raising and lowering the stretcher clamps to maintain exact alignment of the press platen surface with the adjustment clamp surfaces. This mechanical method, much superior to hydraulic synchronization, causes the clamps and stretchers to move in perfect unison with the platen, eliminating entirely the possibility of the belt bending over the edges of the platen ends during the curing process. Press can be built with one or two openings in any size, for any platen pressure.

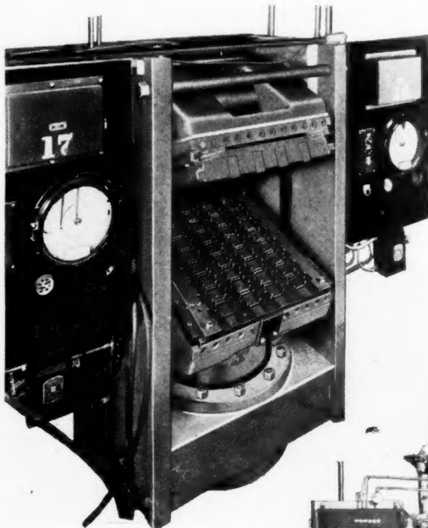


Ram raised . . . molds closed

ALL HYDRAULIC TILTING-HEAD PRESS

Note the accessibility of this press compared with outmoded conventional types. It is simple and rugged, with 24" x 24" platens fastened to a tilting head and a tilting bolster. The platens remain parallel during the first part of the down stroke of the ram, then tilt open during the remainder of the down stroke. Unlike the Automatic Press, the molds never emerge from the Press. Toggles for opening and closing the molds have been eliminated.

The right amount of pressure per square inch on the platens is maintained hydraulically. Wear or variable platen pressures are eliminated.



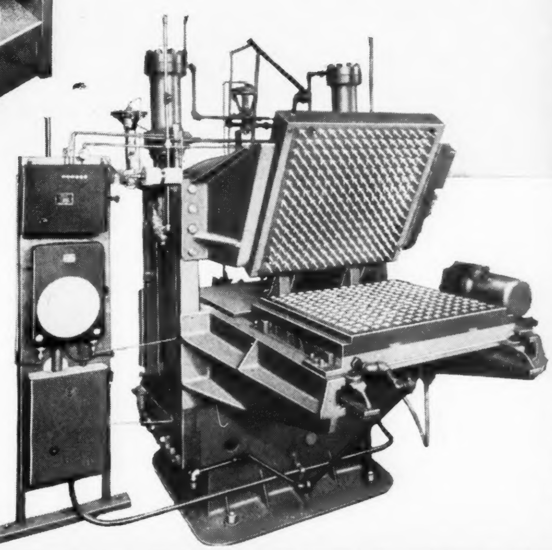
Molds in loading position

SINGLE OPENING AUTOMATIC PRESS

Fully automatic, yet possessing all the advantages of the conventional press for precision molding, this new type automatic, in many instances, has stepped up production as much as 50%.

Operation is extremely simple, with practically all manual effort eliminated. There is no more tugging or handling of heavy molds in and out of the Press. The operator has only to remove the cured articles and replace them with uncured rubber, press a button and the molds recede into the Press and close. A time cycle device opens the Press at the end of the cure and the molds open and move out of the Press and stop in a tilted position, from which the operator can easily strip the cured articles and repeat the process.

Single or double opening Presses can be furnished in this style, to take molds from 32" x 32" to 42" x 42"



BRANCH OFFICES IN PRINCIPAL CITIES

ADAMSON UNITED COMPANY
AKRON, OHIO

How to "wrap up" *improved production*

● If your production involves the application or forming of wire, consider this . . .

Because specialists at National-Standard's Worcester Wire Works probe *deep* into the development and behavior of special-purpose wires, they're often able to suggest modifications that boost production plenty! Sometimes, for example, it's a modification that eliminates machine jamming and down-time. It might be a new or different finish that permits increased production speeds. Or, as often happens, it's an idea that gets the job done with *less* wire or other materials.

You can always count on Worcester Wire Works for service that goes further than usual — for special development help if you want it. And, in any case, you'll find in your National-Standard wire the uniformity, the adherence to specifications that in itself saves time and dollars!

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WORCESTER WIRE WORKS..*Worcester, Mass.*	Round and Shaped Steel Wire, Small Sizes

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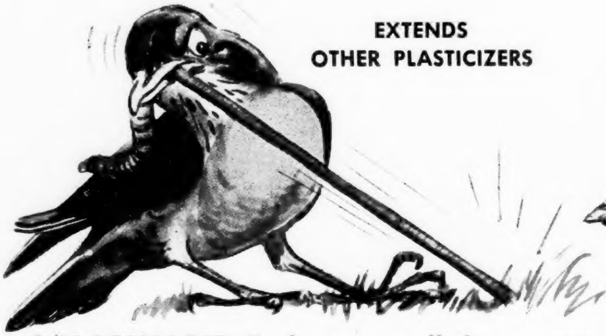
COMPATIBLE
WITH MOST COMPOUNDS

WON'T MIGRATE
FROM FINISHED PRODUCT

EXTENDS
OTHER PLASTICIZERS



S/V SOVALOID C gives you all these processing benefits at extremely low cost

You can't beat this inexpensive plasticizer for Vinyl resins and Buna N. It costs but a fraction of conventional ester-type plasticizers – yet offers many processing advantages.

S/V *Sovaloid C* is completely compatible with all Vinyl and Buna N compounds. It imparts flexibility . . . provides unusual oil-resistant qualities . . . adds greater tensile strength . . . won't bleed from the finished product. It also can be used as an extender of more costly plasticizers.

Get all the facts about S/V *Sovaloid C* from your Socony-Vacuum Representative.

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates:
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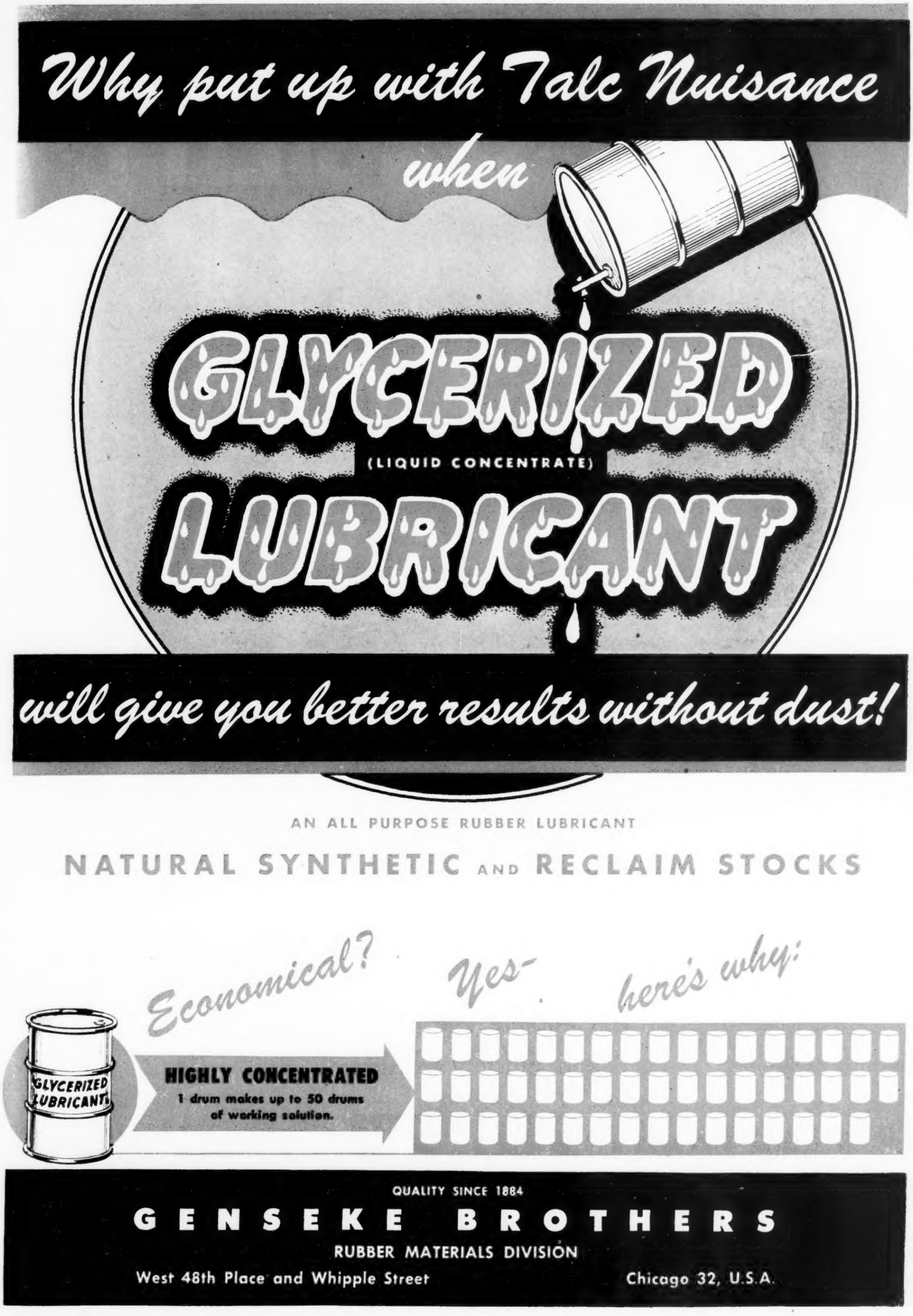

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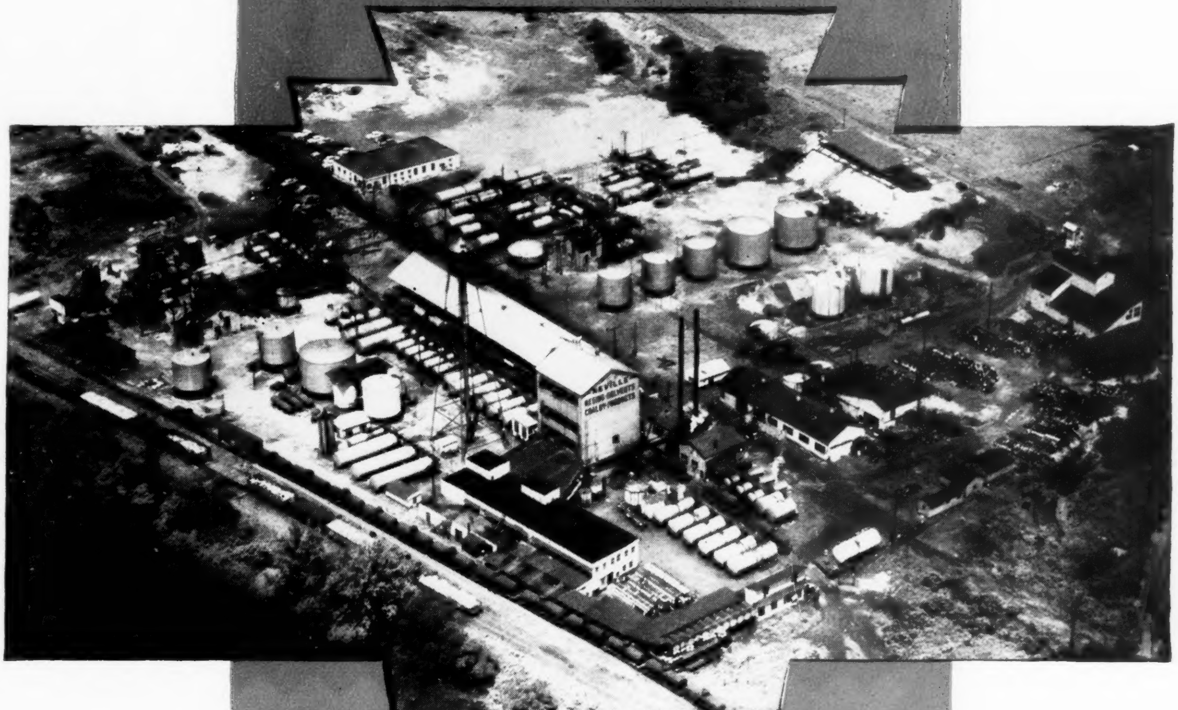

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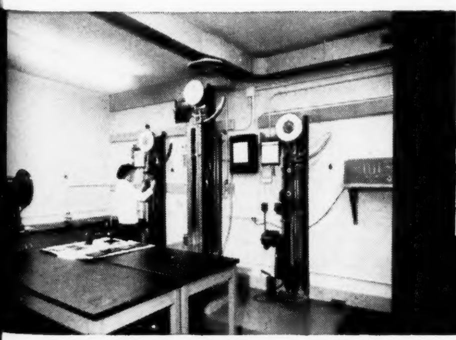

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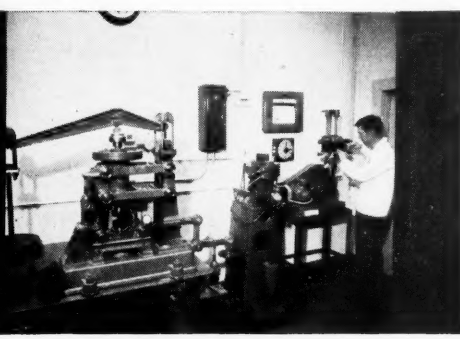
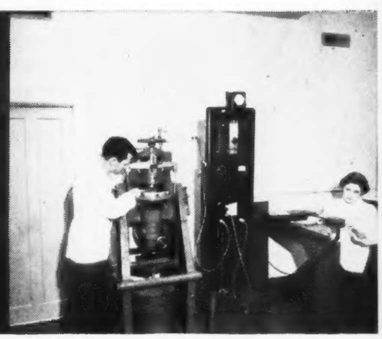


Sectional view of constant temperature-humidity test room showing St. Joe Flexometer, special type flexometer, DeMattia flexing apparatus.



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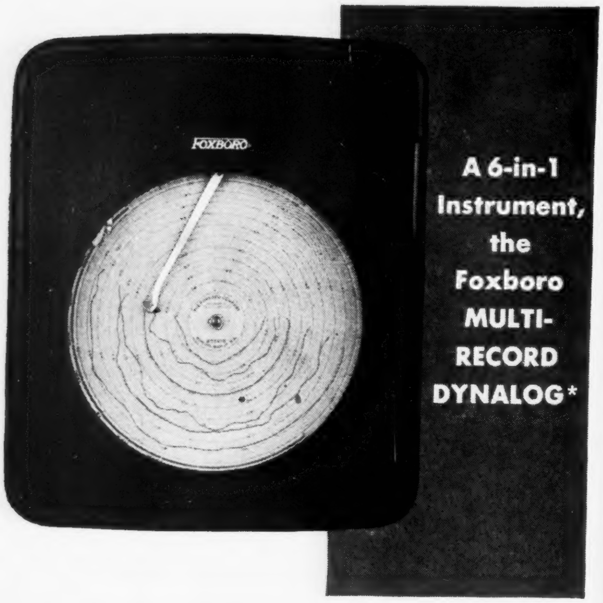

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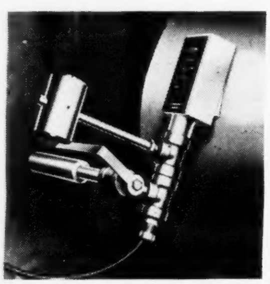

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A Bill Brothers Publication

AUGUST, 1951

Vol. 124—No. 5

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VOL. 124 — NO. 5 AUGUST, 1951

Properties of Natural Rubber Latex from Clonal and Seedling Trees of *Hevea brasiliensis*—I

G. A. Kidder[1]

CONSIDERABLE work has been published concerning the variability of natural rubber latex, but very little information is available regarding the characteristics of the latices obtained from the various *Hevea* clones. An increasing part of the world supply of natural rubber is now obtained from a relatively few vegetatively propagated strains or clones of *Hevea brasiliensis* which were originally selected for their high-yield characteristics. The latices from different clones may be expected to exhibit individual and fairly constant characteristics. There are some references to such clonal differences in the literature. Paton[2] has described the very unstable latex from the clone Glenshiel 1; while Kemp[3] has compared the viscosity changes of several different clones. Results obtained at the Rubber Research Institute of Malaya[4] have shown that there are significant clonal differences in the plasticity of dry rubber. Van Gils and Homans[5] have described clonal variations in the amount of "yellow fraction" found in fresh latex.

In 1939 a broad program of research was started on the Firestone Plantations in Liberia to investigate the properties of latices from several clones and to compare their properties with latices from seedling trees. In the 10 years since this study was first undertaken more than 5,000 samples have been taken from nine clones and two groups of seedling trees and subjected to systematic tests. It is the purpose of this paper to present in a condensed form the results of this large number of tests. In carrying out this study the tests were confined almost entirely to the properties of the ammoniated centrifugal concentrates prepared from the latex. For simplicity this paper is based largely on data obtained for samples collected in 1945, 1946, 1947, and 1948 and almost entirely on those samples collected from trees being tapped on a half-spiral, alternate daily system.

[1]Firestone Plantations Co., Liberia.
[2]*Trans. Inst. Rubber Ind.*, 23, 70 (1947).
[3]*Ibid.*, 61.
[4]"Annual Report of the Research Institute of Malaya," p. 158. Kuala Lumpur (1938).
[5]"Proceedings of the Second Rubber Technology Conference," p. 300. W. Heffer & Sons, Ltd., Cambridge (1948).

In general this study has shown that significant clonal differences exist in some of the properties studied and that most of the properties follow definite seasonal patterns which may, to some extent, be related to seasonal rainfall and wintering of the trees. The affect of the age of the trees has been obscured by such a large number of other factors that it is difficult to draw definite conclusions with relation to this point. Nearly all of the properties studied exhibit regular and significant changes with the age of the ammoniated concentrate. These changes have been followed through 360 days.

All of the data given in this paper are average values based upon results obtained on a very large number of samples. It should be pointed out that individual samples sometimes deviated markedly from the average behaviors discussed in this paper. Such deviations are to be expected when dealing with biological materials.

Experimental Methods

A careful survey of the clonal areas of the plantation was made in 1939, and four tasks from each clone were set aside for use in this study along with tasks from the seedling areas to serve as controls. Each task contained 250 trees. As far as possible, these tasks were selected so as to contain trees of similar age and development, on fairly level and well-drained soils. Over the period during which samples were examined, the clonal trees were 11 to 14 years old; while the seedling trees were more than 18 years old. Good tappers were assigned to these tasks, and they were closely supervised by the research department to assure proper tapping and handling of the latex. The clones selected for study were: AVROS 49, AVROS 50, AVROS 152, Bodjong Datar 5, Bodjong Datar 10, Tjirandji 1, Tjirandji 16, Prang Besar 186, and Waringiana 4. Various tapping systems have been used from time to time on these trees owing to shifting pro-

duction practice; however, since April, 1944, some of the tasks of each of the clones have been tapped regularly on a half-spiral, alternate daily system, and it is with latex collected from these tasks that we are mostly concerned.

A representative three-gallon sample of latex was collected from each clone once a week. This latex which had been ammoniated in the field to 0.10% ammonia was further ammoniated to 0.30% and brought into the laboratory where it was centrifuged on the following morning in a laboratory model De Laval centrifuge to give a concentrate of about 60% total solids. The concentrate was adjusted to 0.70% ammonia by the addition of strong ammonia water and stored in a number of eight-ounce screw top, paraffin sealed bottles until it was needed for testing. A sample of the feed latex was adjusted to 1% ammonia and similarly stored. Samples from nine clonal and two seedling areas were collected each week. For each sample tests were made on the concentrate after 0, 7, 14, 30, 90, 180, and 360 days' storage at room temperature, which was about 30° C. The tests normally run on all samples and at each storage time were ammonia content, KOH number, mechanical stability, critical stability temperature, and viscosity. In addition to these tests the total solids content, ash content, acetone extract, and acid number were run on most samples.

The ammonia contents were determined by titration with 0.10 normal H_2SO_4, using methyl red as an indicator, and are expressed in all cases as weight per cent. based upon total latex.

The mechanical stabilities were determined by means of the constant high-speed stirrer described by Novotny and Jordan.[6] The mechanical stability is expressed as seconds stirring to give the first visible flocs in a thin film of the latex. Mechanical stabilities of concentrate samples were run at 51.5% total solids content, and those of feed samples were run at 25% total solids content. If flocculation had not occurred after 20 minutes' stirring, the tests were stopped, and the mechanical stabilities were reported as 1,200 seconds.

The KOH numbers were determined by a potentiometric titration with 0.356 Normal KOH using glass and calomel electrodes. The end point was taken as the inflection point in the titration curve. The KOH number is expressed as grams of KOH per 100 grams of latex total solids.

The critical stability temperature was determined by submitting a specially compounded sample of latex to a series of temperatures; the critical stability temperature was that temperature at which the compounded latex will gel in 30 seconds. It is reported to the nearest degree Centigrade. The latex compound consisted of 25 grams of the concentrate after dilution to 52% total solids with 0.5% ammonia water plus one gram of a 50% dispersion of zinc oxide in water plus 0.5-cubic centimeter of a 40% ammonium sulphate solution. The 50% zinc oxide dispersion was made by ball milling overnight 50 grams of zinc oxide pigment, two grams of Darvan and 48 grams of distilled water.

The critical stability testing apparatus consisted of a small condenser through the jacket of which water at a series of temperatures was circulated. The latex compound to be tested was drawn up in the column of the condenser for 30 seconds and released. If the latex ran out, the temperature of the jacket was too low and had to be raised until, after 30 seconds heating, the latex failed to run out of the condenser column under the force of gravity. The column of the condenser used had an I.D. of five millimeters and a length of about five inches.

[6] *Ind. and Eng. Chem. (Anal. Ed.)*, 13, 189 (1941).

The viscosity was determined by recording the time for a measured volume of the latex to flow through a calibrated capillary. The latex was carefully strained through several layers of cheesecloth just prior to this determination and diluted to 52% total solids content. The entire determination was carried out in a humidified cabinet at a temperature of 35° C.

The total solids content was determined by weighing out a two-gram sample into an aluminum moisture dish and drying it in an oven at 70° C. for 16 hours. The total solids content is expressed as per cent. dry weight on the basis of total latex.

The ash contents were determined by burning a weighed sample of a total solids film in a muffle furnace. The ash content is expressed as grams of ash per 100 grams of total solids.

The acetone extracts were determined on dried films prepared from the latex by pouring it on glass plates and drying for several days at 50° C. The extractions were carried out for 22 hours in ASTM-type rubber extraction apparatus. The acetone extract is expressed as grams of acetone extractable material per 100 grams of total solids.

The acid numbers were determined by taking up the dried acetone extract in alcohol and titrating with alcoholic KOH, using phenolphthalein indicator. The acid number is expressed as milligrams of KOH necessary to neutralize the acetone soluble acids in 100 grams of total solids.

Variation with Age of Latex

Before proceeding to a discussion of clonal differences it is necessary to consider two main causes of variation in the properties of latex concentrates which are essentially independent of the origin of the latex. The first of these, which is discussed in this section, deals with the changes which occur in the latex during storage, and the second, which will be discussed in the next session, deals with changes which follow a regular seasonal pattern.

On all samples tests were made on the day of centrifuging (0 day) and after 7, 30, 90, 180, and 360 days' storage. Average values for all the samples collected over a four-year period are given in Table 1 and presented graphically in Figure 1.

The ammonia contents were initially adjusted to 0.71% NH_3. They decreased by about 0.02% in the first seven days. After this first rather rapid decrease they fell off at a more or less constant rate of about 0.01% for each 30 days, reaching an average of 0.57% at 360 days. In some cases, about 2% of all samples stored, abnormally large ammonia losses were measured. All such cases were accompanied by abnormally high KOH numbers, low mechanical stability, and often by darkening of the latex and even coagulation. In many cases this condition could be traced directly to faulty seals on the sample bottles which in some cases permitted contact with the iron tops. The data for these samples are not included in the averages given in this paper. While some of the regular decrease in ammonia content can be accounted for by the formation of ammonium salts, it has not been possible to account for all of the ammonia lost in this way. It seems likely that the remainder may be accounted for by slow seepage from the sample bottles and by absorption on the liners used in the lids.

The mechanical stability of a freshly prepared concentrate is very low, being of the order of 100 seconds or less. During the first 30 days of storage the mechani-

TABLE 1. CHANGES IN VARIOUS PROPERTIES DUE TO THE AGE OF THE CONCENTRATE AS SHOWN BY AVERAGE VALUES FOR ALL SAMPLES COLLECTED IN A FOUR-YEAR PERIOD*

Age of latex—in days	0	7	30	90	180	360
Ammonia content, %	0.71	0.69	0.67	0.65	0.62	0.57
Mechanical stability, sec.	....	237	636	770	778	477
KOH number	0.45	....	0.60	....	0.75	0.86
Critical stability, temperature, °C.	....	70	68	65	58	46
Viscosity† Sec	....	205	219	....	185	....

*Each value given is the average of determinations on more than 2,000 samples.
†Average for three years data only.

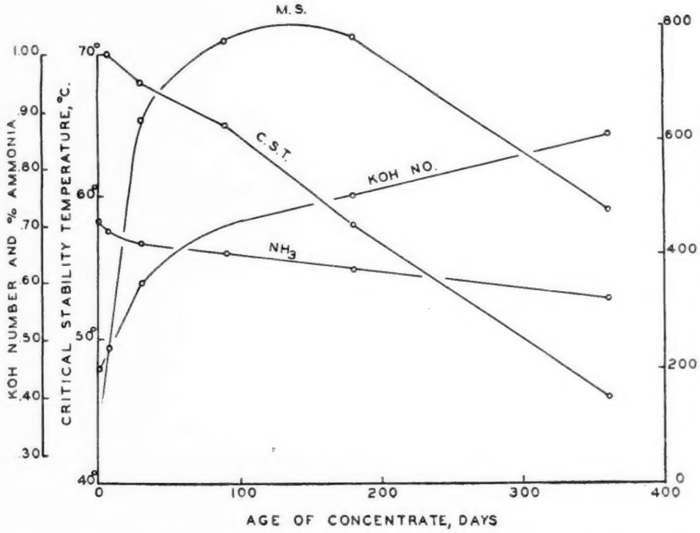

Fig. 1. Changes Which Occur in *Hevea* Latex Concentrates with Age

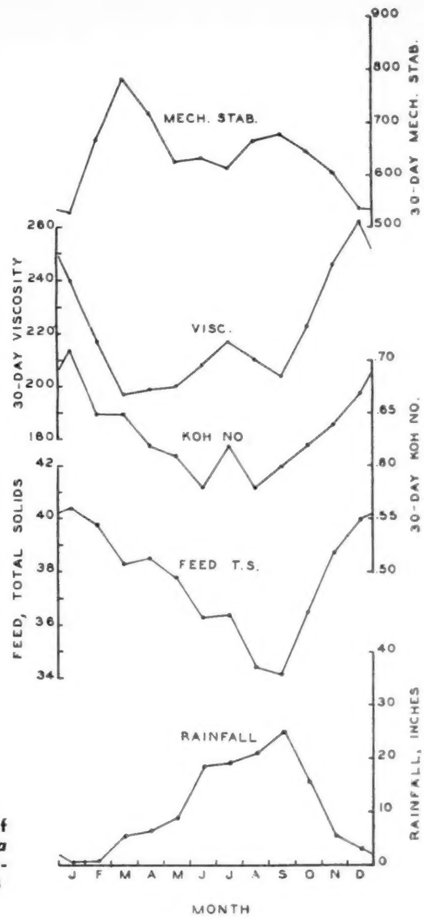

Fig. 2 Effect of Season on *Hevea* Latex Concentrate Properties

cal stability increases very rapidly. After the first 30 days it increases more slowly until it reaches a maximum between about 90 and 180 days, and thereafter it decreases steadily up to 360 days. Limited data for 720-day-old samples and practical experience with even older samples indicate that this steady decrease eventually tapers off to give some limiting low mechanical stability for very old latices.

Present theories of latex stability can account at least qualitatively for this mechanical stability pattern if we assume that during the early part of the storage period the predominate reaction is the formation of ammonium salts of the fatty acids by hydrolysis of ester linkage. These ammonium soaps are absorbed on free areas of the latex particles or displace proteins to increase the stability. Then somewhere between 90 and 180 days most of the ester linkages have been hydrolyzed and the breakdown of proteins to give amino-acid and possibly other low molecular weight materials becomes the predominate reaction. These breakdown materials which are soluble in the serum effectively raise the ionic strength of the serum and account for a decrease in stability. Eventually when all the proteins have been broken down (beyond 360 days), this reaction stops, and the latex remains in a state of balance, but at a very low stability. It is probable that this breakdown of proteins starts from the beginning, but in the early stages is overshadowed by the formation of ammonium soaps.

The data for KOH number do not show a maximum or minimum, but do show a rapid increase during the first 30 days, which slows down to a steady rate of increase somewhere between 30 and 180 days. This condition is in line with the above theory if we remember that both the ammonium soaps and the ammonium salts of amino acids contribute to the KOH number. This point offers additional evidence that the formation of ammonium soaps is occurring rapidly during the early part of the storage period, but eventually stops somewhere between 30 and 180 days. The fact that both the stabilizing ammonium soaps and the destabilizing salts of amino acids contribute to the KOH number accounts for our inability to correlate high KOH numbers with low mechanical stability, although we know that for the extreme cases of latices which have started to spoil the two are always found together.

The data for the critical stability temperature reveal that this property undergoes a continuous decrease with the age of the latex and that this decrease is only slightly faster during the first 30 days than during the remainder of the 360 days. This test, related to other chemical stability tests such as the zinc oxide thickening test, measures the stability of the various latices toward the complex zinc ammonium ion. Several authors including Wren[7] and Jordan[8] have pointed out the correspondence between KOH number and the degree of zinc oxide thickening. This correlation is certainly borne out by the data presented here with the exception that if we push our theory a little further, we may conclude that the amino acids contribute more to lowering the critical stability temperature than do the fatty acids. This point is consistent with the concept that the fatty acids as ammonium soaps are largely absorbed on to the surface of the latex particles.

[7] *Trans. Inst. Rubber Ind.*, 18, 91 (1942).
[8] *Rubber Chem. Tech.*, 12, 590 (1939).
[9] Unpublished report.

Table 2. Seasonal Variations in *Hevea* Latex as Shown by Averaging the Data for 1945 through 1948 by Months

Month	Mechanical Stability, Sec. 7 Days	30 Days	90 Days	360 Days	Viscosity* 30 Days	KOH No. 30 Days	Feed, % Total Solids	Rainfall, Inches
Jan.	226	529	692	413	240	0.71	40.4	0.90
Feb.	256	667	809	465	217	0.65	39.8	1.04
Mar.	236	781	948	518	197	0.65	38.3	5.85
Apr.	196	719	879	486	199	0.62	38.5	6.83
May	215	625	800	434	200	0.61	37.8	9.32
June	217	633	798	535	208	0.58	36.3	18.69
July	226	615	781	434	217	0.62	36.4	19.54
Aug.	241	667	853	561	210	0.58	34.4	21.31
Sept.	275	678	875	539	204	0.60	34.2	25.21
Oct.	259	647	829	490	222	0.62	36.5	15.92
Nov.	259	606	733	419	246	0.64	38.7	5.79
Dec.	241	537	657	387	262	0.67	40.0	3.50

*Average for three years only.

The viscosity of the latex increases between seven and 30 days and decreases between 30 and 180 days. Limited data on 360-day-old samples indicate that the viscosity continues to decrease between 180 and 360 days. Thus in a very general and qualitative manner the viscosity parallels the mechanical stability behavior. It will be shown later that for latices of the same age there is an inverse relation between mechanical stability and viscosity. It thus appears that the relation between these two properties is complex. It should be stated here that while average viscosity values based on a large number of samples appear to follow definite patterns, there were actually large and often unexplained variations for individual samples. In an earlier and much more careful study of this particular problem, Harkins and Wood[9] showed that during the first 10 days the viscosity decreases, rapidly reaching a minimum between about 10 and 15 days after which it increases slowly, reaching a maximum between 20 and 50 days and then starts to decrease at a more or less constant rate. While it is difficult to explain the early changes in viscosity, the steady decrease of the later period is probably accounted for by the decomposition of hydrated proteins.

While acetone extract and acid number determinations were not run on all samples, consistent data were obtained for more than 100 samples from two clones over a period of two years. Average data for samples aged one day and 180 days respectively were as follows:

Age of concentrate	1 day	180 days
Acetone extract	2.66	2.70
Acid number	69	172

These average data obtained in a routine manner on a relatively large number of samples do not necessarily disprove the theories that small but important changes occur in the quantity and composition of the acetone extract, but they do seem to establish the fact that there are no large changes in the amount of acetone extractable material. The increase in acid number from one day to 180 days merely corroborates the data for KOH numbers in showing that the amount of acidic material in the latex increases with the age of the latex.

All this discussion shows very clearly that one of the most important factors in determining the properties of a given ammoniated concentrate is the age of that concentrate. It is pointless to compare two concentrates of different ages unless this factor is taken fully in to consideration. It is regrettable that much of the latex work in the literature makes no mention of the age of the latex used. In many cases it is questionable if the investigators themselves knew the age and past history of the latex upon which they were working. For the purpose of determining clonal differences in this work all comparisons will be made for latices of the same age. In general 30-day-old latex will be used as a basis of comparison since for most properties conclusions based on latex of this age are valid for other ages as well. The properties at 30 days are arbitrarily selected for emphasis because by that time most of the rapid and sometimes erratic changes which occur early in the storage period are nearing completion and because it is often desirable to evaluate a given latex without having to wait too long for the answer.

In a later section it will be shown that for certain properties, and especially for mechanical stabilities, there are consistent clonal variations in the behavior on aging.

Seasonal Variations

The second cause of variation we must consider before discussing clonal differences deals with the changes which occur in the various properties at different seasons of the year. In the discussion it will be shown that many of these seasonal variations are directly related to the rainfall or more accurately to rain dilution of the feed latices. In carrying out this experiment samples were taken weekly regardless of weather condition except that when the total solids content of a sample was below 25% it was discarded, and an effort was made to obtain a second or even third sample that week. If the week passed without obtaining a sample having a total solids of 25% or better, then no data were recorded for that week. The number of such blank weeks represents less than 1% of the period covered.

The data of Table 2 show the effect of season on certain selected properties. The table also includes average rainfall data for the period as obtained at a station centrally located with reference to the experimental plots used in this study.

The first and most obvious relation is that between the average feed total solids and the rainfall. No effort has been made in this study to differentiate between changes in the total solids of the latex in the latex vessels and external rain dilution. It suffices for the purpose of this study to show that during the year the average feed total solids was directly related to the seasonal rainfall.

Previous work in these laboratories has shown that dilution of a feed latex with distilled water prior to centrifuging has a definite effect on many of the properties of the concentrate prepared. Dilution of the feed total solids to about one half its original volume resulted in: a considerable increase in mechanical stability, a slight increase in the critical stability temperature, and decreases in the amount of acetone extract, the KOH number, the acid number, and the ash content of the concentrates prepared. There is nothing unexpected about any of these observations except perhaps the increase in mechanical stability. This too is easy to explain since dilution lowers the ionic strength of the serum considerably without affecting appreciably the stabilizing materials absorbed on the surface of the rubber particles. That the materials absorbed on the surface of the rubber particles are not entirely unaffected is shown by the fact that dilu-

(*Continued on page* 575)

A Review of the Mechanism of Flex-Cracking and Flex-Cracking Tests—III

J. M. Buist[1] and G. E. Williams[1]

THE following installment concludes the review on information in the literature on flex-cracking, undertaken by the authors at the suggestion from the 1949 ISO/TC/45 meeting and presented at the 1950 meeting. The complete paper is being published in India Rubber World *in three parts; this is the final installment.*

Physical Conditions Applied to the Sample during Test

Physical conditions cover the effect of different stresses and strains together with sample shape, surface smoothness, nicks, speed and temperature of test.

Elongation

Cooper (8) found with a natural rubber tire-tread stock on the Firestone machine that with a minimum elongation of zero the rate of cracking increased as the maximum elongation was increased. This finding was confirmed by Rainier and Gerke (17) using a bend-flexing machine, and by Eccher (27).

Cooper also found that the rate of cracking was greatest when the sample was returned to zero strain each cycle. This point was confirmed by Rainier and Gerke using a bend-flexing machine, and Cassie (2) using a modified Vogt machine [see also Cadwell *et al.* (5)].

Busse (46) found the life was infinite if the sample was held under a constant minimum strain, since the tear reversed into an arrowhead.

Rainier and Gerke (17) investigated the possibility of an "endurance limit" and claimed to be able to estimate the mileage at which shoulder cracking would become troublesome in a tire.

Eccher (27), using both ring and trapezoid specimens, found that the deepest cracks corresponded to a minimum elongation of 10%, which caused him to consider the part played by ozone in flex-cracking.

Schwarz (21) measuring cut growth of GR-S on a DeMattia bend-flexing machine found that with minimum strain zero, cracking was quicker as the maximum strain was increased from 90-degree bend to 115-degree bend, but increased still further when both minimum and maximum strain were increased by a constant angle. The former observation is in keeping with those on natural rubber, but there are no corresponding data on the latter.

Prettyman (47) suggested that each cycle of a flexing test should include extension, zero strain, and compression, but the last is not possible on the DeMattia test.

Crack Initiation

Rainier and Gerke (17) pointed out that most flex-cracking tests included in the rating an "induction period" before cracks began, and proposed a test (for natural rubber) in which cracks were initiated by ozone before the test began. They claimed that this practice reduced the variations in the test.

More recently many authors have attempted to measure the flex-cracking of GR-S by means of standard tests and have found the results to be very erratic unless a cut was initiated. In other words, the flex-cracking of GR-S was so erratic that a crack growth test had to be used instead.

Among the methods proposed are pin holes with a shielded steel point, cuts made with the corner of a razor blade, and cuts made right across the sample.

Buist and Powell (48) have found useful a spear cut made in the direction of the groove instead of a pin hole, since errors due to the crack growing initially in an arbitrary direction are reduced, and the crack is directed along the groove in which it must eventually run. At the recent ISO meeting in Akron, Shearer (49) described similar work conducted on behalf of subcommittee XVIII of ASTM Committee D-11 and confirmed these conclusions. The I.C.I. probe locator, which is suitable for inserting the cut, has been described by Buist (50).

Temperature

Somerville (18), using a DeMattia bend-flex test with natural rubber gum stocks, found that the rate of cracking decreased with rise of temperature, but Rainier and Gerke (17), using a similar test, with cracks initiated by ozone and an improved method of rating, found that the rate of cracking of a natural rubber tread stock increased with temperature.

A tendency for increase of temperature (from 65-80° F. to 80-95° F.) to produce longer flexing life has been found (51) with natural rubber tread compounds protected with antioxidant in the du Pont machine. Carlton and Reinbold (20) found a natural rubber tread compound in the du Pont machine at room temperature (82° F.) gave cracks which did not penetrate perpendicular to the surface of the test piece, but turned at an angle; while at an elevated temperature (180° F.) all the cracks were perpendicular to the surface. These authors used an elevated temperature for this reason and because GR-S loses tensile and tear strength at the elevated temperatures prevailing in belts and tires. It was found that the increasing rapidity of crack growth with increasing time of cure in GR-S was much more pronounced at 180° F. than at 82° F. At the elevated temperature neoprene was equal or slightly inferior to natural rubber. Carlton and Reinbold concluded that the results of flex-cracking tests made at elevated temperatures were entirely different from those of tests made at room temperature, but this point is contradicted by Breckley (19) who says that tests at 100° C. in general confirm those at room temperatures, in crack growth tests on GR-S on a DeMattia machine. Breckley

[1] Imperial Chemical Industries, Ltd., Manchester, England.
[2] Numbers in parentheses refer to Bibliography items at the end of this installment. For references 1-32 see our June, 1951, issue, p. 322; for 33-45, see July, p. 449.

adds that some compounds of GR-S which were not cracked badly after 50,000 flexes at room temperature failed completely in one tenth of the time at 100° C.

Speed of Test

Very little data have been found on the effect of speed of test on flex-cracking.

Somerville (18, 52) stated that his results were independent of speed, but as his highest speed was 275 cycles/min., and no tread stocks were tested, this problem should be investigated further, since one would expect increased speed to reduce the number of cycles to failure. Recently Crompton (53) has found that with tests on a DeMattia machine at 230, 300, and 370 cycles per minute the flex-cracking resistance passes through a maximum at 300 cycles per minute. Further work is required to extend these investigations.

State of Material Comprising the Sample as Received for Test

The above head covers such points as type of rubber, fillers and flocculation, state of cure, effect of antioxidants and other agents present.

Fillers

NATURAL RUBBER. Cooper (8) found that increasing the loading of channel black in a natural rubber tire tread compound increased the rate of cracking on the Firestone machine.

Street (13), using the same machine, found that grit (separable by screening) in carbon black, previously shown to reduce tensile and other properties, also reduced the flex-crack resistance of natural rubber tested on the Firestone machine.

A trend toward high flexing life on the du Pont machine with natural rubber tire-tread stocks containing 47½ parts of black instead of 40 parts has been noted (51) although stocks with 30 parts or less last much longer. All the above mixes contained an anti-flex-cracking agent.

Cooper (8) has also found that with a natural rubber tire-tread compound tested on the Firestone machine, addition of reclaim increases the cracking, and clay even more so (but see Breckley below).

Shepard, Street, and Park (54) state that flex-cracking is perhaps an unfortunate concomitant of the main reinforcing effect of powders; and in spite of Neal and Northam, "there seems to be little doubt that the first effective causes of cracking are: (a) Localized strains round grit, as shown by Street (13), and by Gray, Karch, and Hull (9). (b) The breaking up of agglomerates. Separation of rubber from coarse particles has been demonstrated by Depew and Easley (55). There is no evidence that weakness of adhesion of pigment to rubber is a cause of relative differences for if this were the case, the cracks would soon be innumerable."

It should be noted here that the last statement appears to ignore the fact that as soon as a crack forms, the tension will be relieved in its immediate neighborhood, as is stated by a number of authors.

Eccher's (27) observation of the cracks which appear during flexing is also relevant. Microscopic examination (X80) revealed that after flexing there are (a) numerous tiny cracks, uniformly distributed and not always visible to the naked eye, and (b) a few relatively large deep fissures, irregularly distributed. All cracks and fissures are perpendicular to the direction of elongation apart from a few exceptions owing chiefly to marks made on the specimen. In general, but not always, small cracks appeared before fissures formed. Eccher attributes the small cracks to ozone.

Russell (56) says, "It is commonly believed that the tendency to flex-crack is greater in vulcanizates loaded with carbon black than in those containing other fillers. This belief probably arises from the fact that articles most commonly subjected to flexing in service are compounded with carbon black (e.g., tire treads, footwear, soles). The fact is that, for equal volume loadings, certain other fillers produce flex-cracking more rapidly than does carbon black."

Flex-cracking can be retarded substantially by avoiding overloading. In most abrasion resistant vulcanizates, carbon black loading is seldom more than 48-50 parts by weight (about 28 volumes), based on the rubber, and more might be used if flex-cracking could be improved.

The present authors find that no two samples crack in identical ways, e.g., a heavily loaded mix with non-reinforcing black gives cracking along the base of the grooves; whereas a protected reinforced mix more often than not breaks down at the flaws, i.e., it gives only one short deep crack.

GR-S. Breckley (19) tested crack growth of GR-S on a DeMattia machine and found that the rate of crack growth increased with degree of black loading at room temperature, which was confirmed at 100° C. The addition of 10-20 parts "hard" clay to a GR-S carcass or tread stock resulted in an improvement in flex life. This was also shown with nitrile and natural rubber stocks. It was suggested that this was due to orientation of pigment, which appeared to be confirmed by X-rays. A tire was made with a composite tread; one half was normal, and the other the same with the addition of 10 parts of clay. The tire was punctured entirely through the tread and carcass in several places, and after a run several cracks had proceeded from the punctures in the normal tread, but none in the special compound.

Schwarz (21), using GR-S on the DeMattia bend-flexing test with an initiated cut, found that increasing the M.R. content increased the flex-crack resistance. Increasing the EPC black content decreased resistance, but with certain angles of flex (0-90 degrees) this effect was reversed with high M.R. contents.

Additive Agents

As this survey is concerned with the improvement of flex-cracking tests rather than improvements in the flex-crack resistance of particular compounds, a careful note of compounds claimed to improve flex-cracking has not been made.

The chief results of interest are:

Many authors state that while certain antioxidants have no great effect on flex-crack resistance, others, such as Vulcaflex, cause a considerable improvement, and no compound other than an antioxidant has been found to improve flex-cracking.

Somerville (18) has claimed that oxygen absorbers improve flex-crack resistance, and Russell (56) states that promising results have been obtained with such materials. However, Cassie, Jones, and Naunton (2) have failed to confirm these claims, and Somerville has allowed his patents on this subject to lapse.

The addition of certain softeners to GR-S improved the flex-crack resistance (see correlations with modulus below).

State of Cure

NATURAL RUBBER. *Choice and Amount of Accelerator and Curing Agent.* Somerville and Russell (57) found that although the flex-cracking of low sulfur vulcani-

zates was worse than that of compounds containing normal sulfur, the low sulfur compounds are much better than normal vulcanizates after aging.

The inferior flex-cracking resistance of the low sulfur super-aging vulcanizates was noted by Somerville (18) and Cassie, Jones, and Naunton (2).

Rainier and Gerke (17) considered that flex-crack resistance could be improved by attention to cure, and Russell (56) stated that flex-cracking could be reduced by proper choice of accelerators and percentage of sulfur. MBT and its derivatives give excellent results, and the sulfur rubber ratio should be kept as high as possible consistent with good aging and freedom from bloom. In tread formulae (says Russell) 3% S, based on the rubber, is about the lower limit. Reducing the percentage of sulfur increases the tendency to flex-crack.

Claims have been made that flex-cracking and ply separation can be improved by the use of selenium.

Time of Cure. Bierer and Davis (58) found that flex-life measured by ply separation on the Scott pulley bend test decreased rapidly with over-vulcanization.

Booth (15) found that overcures cracked worse than undercures, tested on an improved Torrance Peterson machine, and Somerville (52) found the same effect with gum stocks on a DeMattia bend-flexing machine.

Somerville (18), using a DeMattia bend-flex test, found that in general the cracking of natural rubber tread stocks was considerably worse when overcured and in some cases slightly worse when undercured.

Cassie, Jones, and Naunton (2) stated that the effect of cure on flexing life helps confirm the supposition that oxidation is not the only factor in flex-cracking.

Russell (56) stated that under and overcured compounds flex-crack sooner than do the same compounds vulcanized to their optimum state.

SYNTHETIC RUBBER. Carlton and Reinbold (20), testing the crack growth of GR-S on a du Pont belt-flexing machine, found that the state of cure had a radical effect, especially in tests at elevated temperatures, and the rate of cut growth increased with time of cure.

Breckley (19) tested the crack growth of GR-S on a DeMattia machine and found that in tests at R.T. the rate of crack growth increased with tightness of cure. The choice of accelerators and sulfur ratio had little effect if the state of cure was the same, and the results were confirmed at 100° C.

Processing Factors

Torrance and Peterson (14), testing natural rubber on the India Tire & Rubber Co. machine, found that "cold-checks" and calender grain cause premature cracking with mill-prepared test pieces, and the ASTM specify that the grain shall be perpendicular to the grooves (i.e., in the direction in which the rubber is elongated) in the du Pont belt-flex test and in the DeMattia dumbbell extension test, but the direction of grain is not specified in the DeMattia bend-flex test. The same applies in the case of B.S.903, and it appears that the specification of direction of grain may require further consideration.

Schwarz (21) has found that crack growth results for GR-S on the DeMattia bend-flex test are not affected by the direction of the grain during the preparation of samples for cure.

Relation with Other Tests

Natural Rubber

Cassie *et al.* (2) have correlated flex-cracking on the du Pont and the Vogt machines with aging and frictional loss, using the formula

$$F = \frac{K}{T_o - T} - af$$

where F is the flexing life, $T_o - T$ is the drop in tensile strength on aging, K is a constant, "f" is a measure of the torsional frictional loss, a is a constant.

Fielding (59) found that the flexing life of natural rubber is increased when the elongation is such that the specimen remains in the range of partial crystallization.

Undoubtedly the set of the rubber, which may change throughout the test, is an important factor in flex-cracking tests, and Buist (26) and Newton (7) have drawn attention to its importance and the fact that it can complicate interpretation of data.

Behre (1) found a relation between modulus at 200% elongation and DeMattia flex-crack resistance in a particular stock as the amount of softener was increased.

GR-S

Schwarz (21), using the DeMattia bend-flex test in crack growth tests on GR-S, found a straight-line relation between modulus at 300% elongation and crack growth resistance when plotted on double log. paper. With ASTM D430 which gives 65-180-degree angle of flex the correlation is very good, but with angles of 0-115 degrees, and 0-90 degrees the relation is to some extent dependent on the amounts of EPC black and M.R. in the compound.

Juve (6) used the following formula for GR-S tread stocks to relate flexing life on the DeMattia machine with heat build-up on the Goodrich flexometer.

$$\log. \text{ flexing life} = 0.0126\ T + 4.28$$

This formula applied to stocks containing EPC or MPC blacks. If the black loading was varied, the following relation held:

$$\log. \text{ flexing life} = 5.42 + T - M$$

where M is the modulus at 300% elongation.

It might be thought that there should be a high correlation between tear results and flex-cracking. Buist (60) used nicked crescent-tear test pieces and measured the growth of the nick on the Vogt machine. There was no significant correlation among crescent tear, the growth test described above, and crack growth carried out by inserting a needle hole through Flipper test pieces and measuring the rate of growth. Holt and Knox (61) have described and compared 13 methods of measuring crack growth and conclude that the severity of the test is increased with rubbers which crystallize if the strain passes through zero in a flexing cycle. On the other hand, with rubbers which do not crystallize, such as GR-S, the passing through zero strain seems to be of no particular significance.

Storey (62) has related the crack growth, measured on a machine similar to the DeMattia, to the initial dynamic compression on the Goodrich flexometer by means of regression equations. By the same technique the heat developed on the Goodrich flexometer is related to the compressed height of the test pieces after 15 minutes' running. Different regression equations are necessary for different types of GR-S polymers.

Morris and Ford (63) studied crack growth on a DeMattia machine and compared test pieces where the crack is initiated by a razor blade and by the partial or complete penetration of a needle. They found that greater precision was obtained using the razor blade if the criterion was final crack length instead of crack growth, and although the rate of crack growth is correlated with the thickness at the bottom of the groove, they suggest that the present close tolerance of ±0.0015-inch in ASTM D813-44T is not justified.

Discussion of Du Pont, DeMattia, Flipper, and Vogt Machines

The main conclusion arising out of this review is that although many workers in this field appreciate the difficulties associated with flex-cracking tests, a satisfactory test technique which will give reproducible results has still to be evolved. The between test piece variation is too large, and further work to draw up a satisfactory schedule for preparation of test sheets is urgently required. This step seems a very necessary first step as the present flex-cracking tests are unsatisfactory in view of poor reproducibility of results, and future work hardly seems profitable until existing errors are reduced.

In order to arrive at some useful conclusions it may be helpful to summarize a few points with reference to the above four machines.

Du Pont Belt Flexing Machine

The modified angle arm on the machine (26) has been incorporated in B.S.903 and also appears in the latest draft of ASTM D430. This desgn of the machine insures that the tension in the belt remains constant. Even so, however, Buist and Williams (28) have found that the error on this machine is very large with the between test piece variation being the largest contributory factor.

Apart from the inherent errors associated with flex-cracking tests it suffers from the additional defect that the stresses and strains on the rubber are affected to an unknown extent by the fabric backing. For work on effect of various atmospheres and effect of temperature the machine is too bulky to be convenient, and its inherent construction makes it useless for work on effect of variations in stresses and strains.

DeMattia Machine

The method of using the DeMattia machine is specified in B.S.903 and ASTM D430. This test has been studied in great detail by Newton and Scott (64). They point out that their errors of measurement are small, using the method described by Newton (22), but the variation between nominally identical test samples is so great as to offset largely the advantages gained. Numerous factors were investigated including replicate cures, illumination, sample thickness, distance between grips, but the outstanding effect remained the variability between nominally identical samples. Similar results have been obtained with the du Pont belt flexing tests (28).

This machine is more compact than the du Pont, and it is more suitable for studying the effect of changes in test conditions and test environment.

Flipper

This appartus is fundamentally unsatisfactory for development work as the type of strain is extremely complex. Apart from simple bending, the sample is subjected to an impact at the moment of hitting the idler wheels and oscillates several times about a mean position after leaving the idler. Powell (65) has found that the oscillations may be such that a test piece may pass under one of the idler pulleys without striking it. Using a high-speed camera, Buist (60) found that only compounds of similar damping characteristics should be tested on the same wheel as otherwise the test pieces would contact each other during oscillations between impacts. These difficulties were communicated to the ASTM, and Baker (66) confirmed similar troubles had been experienced, and the test was no longer widely used in America.

Vogt Rocker Machine

Although commonly referred to as a fatigue tester, this machine tests flex-cracking as defined at the beginning of this report, but there is no prior reason why fatigue should play a greater part in relation to oxidation on this machine than on the other two.

There are two inherent defects in this machine. The first is that the stresses and strains round the hole, where cracking takes place, depend to a large extent on the extensibility of the rubber in the portions of the sample between the hole and the grips. The results are certain to be erratic for as soon as a crack begins, instead of relieving the strain and providing a sort of compensating mechanism, the strain is increased by the stress being concentrated over a smaller area and is hardly reduced by the opening of the crack since the greater extension is taken up in the rest of the sample between the hole and the grips. This variability in the results of extension tests, when taken to break, has been observed by Cooper (8), who recommended that samples should be rated before break.

The second defect is one common to all flex-cracking tests and arises from the fact that in order to produce cracking in the required place, a hole or groove must be provided to concentrate the stresses. The result of this is that the stresses and strains at the point of cracking are unknown.

This problem is serious and may be the cause of the apparent reversals in the effect of various factors on flex-cracking tested on different machines.

If any work is to be done on flex-cracking which is other than empirical, some attempt must be made to solve this problem in order that the stresses and strains at the point of flexing may be known.

Conclusion

At the ISO/TC/45 meeting in Akron there was substantial agreement with the views expressed in this paper, and it was agreed that only the DeMattia machine should be considered for international standardization. It was also agreed that the question of crack growth should be tackled before flex-cracking tests.

Acknowledgment

In the preparation of this paper the authors have benefited from many helpful discussions with their colleagues at Blackley, and they particularly wish to thank G. N. Welding for his contributions. Members of the United Kingdom delegation and the United States delegation to ISO/TC/45 made useful comments and suggestions, and their assistance is gratefully acknowledged.

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The Production and Utilization of High Mooney Viscosity Synthetic Rubber—II[1]

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THIS second installment concludes the presentation of the work of The General Tire & Rubber Co. and Polymer Corp., Ltd., on the production and use of high Mooney viscosity GR-S and other-type polymers which, when blended with considerable amounts of certain petroleum oils, preferably by the latex compounding technique, show very marked improvements in the properties of tires and other rubber products made from them. Tread wear results and some results of the use of these high Mooney viscosity oil-rubber blends in certain mechanical goods items are reported in this concluding installment.

Factory Development

A comparison of the time required to prepare masterbatches of rubber, oil, and black by the dry mix, rubber-oil latex compound and rubber-oil-black latex compound techniques will indicate the saving in factory Banbury time possible through use of the latex compounding step. Typical factory data are presented in Table 11. The rubber-oil latex compound and the rubber-oil-black latex compound show obvious advantages in the time required. The dry mix technique generally results in poorer dispersion and is more difficult to control in the factory. Results with the latex compounds are quite reproducible.

Compounding Variables

Several compounding variables were studied in #11 Banbury mixer. These data indicate that the modulus at 300% and durometer hardness may be controlled by maintaining the proper balance of black and oil. It is also possible to obtain any desired Mooney viscosity level by raising the black and oil ratio while still maintaining the desired modulus level. The results of these variables are shown in Table 12 and Figures 8 and 9.

One difficulty was observed in producing the initial Banbury masterbatch of Krynol (XPRD-233) and carbon black. The masterbatch issued from the Banbury as a mass of coarse crumbs which, however, could be massed by one pass through a moderately tight set mill. It was noted that the Mooney viscosity of the masterbatch dropped continually during the remilling of the masterbatch, the preparation of the final mix, and the extrusion of the tread. It appeared difficult to do sufficient work on the Krynol (XPRD-233) in the Banbury to reduce the Mooney viscosity to an approximately "steady state" condition. Therefore the Mooney vis-

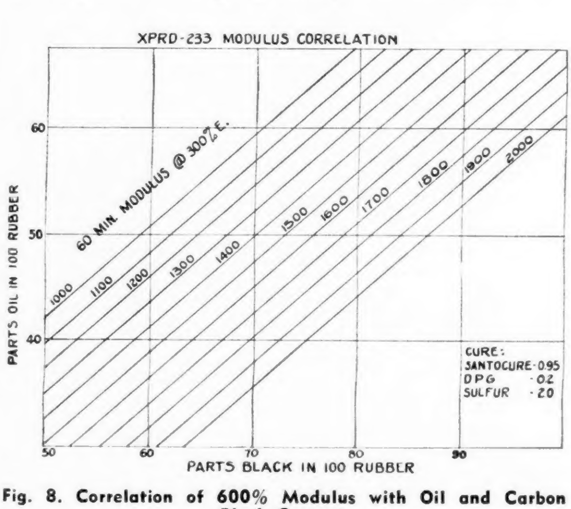

Fig. 8. Correlation of 600% Modulus with Oil and Carbon Black Content

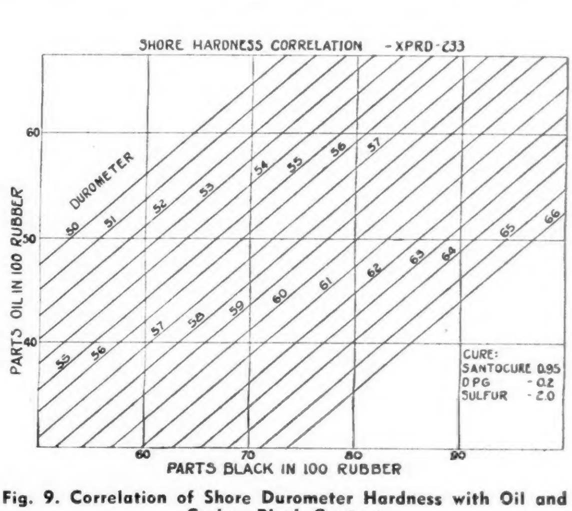

Fig. 9. Correlation of Shore Durometer Hardness with Oil and Carbon Black Content

TABLE 11. COMPARISON OF MIXING SCHEDULES FOR DRY MIX, RUBBER-OIL LATEX COMPOUND, AND RUBBER OIL-BLACK COMPOUNDS

Dry Mix

Time Min.	Additions
0	Rubber
1	½ the oil under ram
4	¼ the oil under ram
5	Black over ram
6	Black and compound over the ram
7	Black over ram
8	Black over ram
9	¼ the oil over the ram
10	Dump
11	Second cycle

Rubber-Oil Latex Compound

Time Min.	Additions
0	Rubber
3	Black over the ram
4	Black and compound over the ram
4½	Black over the ram
5	Oil
6½	Dump
7½	Second cycle

Rubber-Oil-Black Latex Compound

Time Min.	Additions
0	Rubber and ½ the oil
2	Black and compound
4	Oil
5	Dump
6	Second cycle

[1] Presented before the Rubber Chemistry Division, Chemical Institute of Canada, Kitchener, Ont., Canada, June 15, 1951.
[2] General Tire & Rubber Co., Akron, O.
[3] Polymer Corp., Ltd., Sarnia, Ont., Canada.

TABLE 12. VARIATION IN PHYSICAL PROPERTIES WITH DIFFERENT OIL AND BLACK CONTENTS—FACTORY MIXED COMPOUNDS

Krynol (XPRD-233)

Cure: 0.95 Santocure, 0.2 DPG, 2.0 Sulfur

Mixing: #11 Banbury—40 RPM Masterbatch—30 RPM Finish Batch

Rubber	100	100	100	100	100	100	100	100	100	100	100
Oil	50	60	60	60	60	60	45	50	50	50	50
Black	85	70	75	80	85	90	75	66	60	75	80
Physical Properties											
Modulus @ 300% E., p.s.i.											
15 min. @ 287° F.	525	50	50	175	175	150	325	200	100	375	675
30	1475	500	650	825	1200	925	1300	875	600	1250	1330
45	1750	775	950	1200	1300	1400	1500	1225	975	1550	1600
60	1975	900	1100	1300	1500	1625	1700	1275	1050	1625	1740
90	2075	1000	1200	1400	1525	1650	1800	1425	1100	1725	1800
Tensile Strength, p.s.i.											
15 min. @ 287° F.	1750	300	400	575	1300	525	1450	1000	275	1675	2125
30	2750	2875	2400	2475	2300	2350	2675	2650	2725	2825	2925
45	3025	2550	2700	2825	2425	2550	3200	2975	3000	3300	2800
60	2825	2625	2700	2900	2725	2700	2725	3050	3000	3175	2825
90	3225	2750	2600	2950	2725	2500	2700	2700	2775	3125	2800
Elongation, %											
15 min. @ 287° F.	680	860	870	800	760	760	730	790	870	760	640
30	480	740	700	630	575	600	530	580	690	535	490
45	480	640	600	520	470	480	520	540	570	500	460
60	400	590	570	550	490	450	435	530	580	480	420
90	400	590	500	520	460	440	405	480	525	400	430
Hardness											
15 min. @ 287° F.	54	40	42	45	45	46	50	46	40	50	53
30	61	45	49	50	53	53	50	52	46	55	59
45	62	49	53	55	55	56	60	55	50	60	60
60	62	50	54	55	57	58	60	55	52	60	60
90	62	52	55	56	58	60	60	57	52	60	61
Rebound											
Cold	51.5	54.4	54.4	54.4	52.5	51.5	..	55.9	59.5	53.5	..
Hot	68.4	..	..	..	..	..	..	..	72.3	69.6	..
Mooney Viscosity 1½-4′											
Masterbatch	160–131	103–94	114–100	127–112	136–115	135–111	148–130	125–111	107–100	146–125	141–129
Finish batch	110–94	75–68	79–71	85–75	88–77	80–71	120–101	96–81	83–76	103–90	108–96

TABLE 13. COMPOUNDING VARIABLES, FACTORY PROCESSING DATA, PHYSICAL PROPERTIES, AND TIRE TEST RESULTS

Test No.	2614		2831		2845			2911			2914		
Polymers tested	X-486*	XPRD-116	X-486*	XPRD-211	X-556†	XPRD-Blend II	XPRD-Blend III	X-486*	XPRD-130	KBX-56	X-486*	80% X-486 20% XPRD-130	80% X-486 20% XPRD-129
Computed Mooney	45	240	45	135	37	140	200	45	120	120	45	..	..
Method of mixing	rubber-black master-batch	rubber-oil-black mixture		dry mix	cold rubber black master-batch	dry mix	dry mix		dry mix	rubber-oil-black-mixture		dry mix	dry mix
Variables													
Polymer	100	100	100	100	100	100	100	100	100	100	100	100	100
HAF Black	50	85	50	75	50	75	85	50	75	75	50	55	57
Oil	5	60	5	55	13	35	60	5	45	45	5	12	16
Accelerators	std.	1.25	std.		std.	0.9	0.8	std.	1.2	1.2	std.	1.0	.9
Sulfur	std.	2.	std.		std.	2.0	2.0	std.	2.0	2	std.	1.9	1.9
Mixing Cycle, #11BB													
Masterbatch	5 min.	6 min.	5 min.	11½ min.	5 min.	8 min.	8 min.	5 min.	8 min.	8 min.	5 min.	6 min.	6 min.
Second master							5 min.		5 min.	5 min.			
Final batch	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.
RM		3 min.											
Mooney Viscosity–ML4													
Masterbatch	95–73	181–104	95–73	135–125	93–71	91–76	96–85	95–75	103–94	110–103	95–73	106–88	105–95
Second master							80–69						
Finish	72–60	101–90	72–60	82–75	71–62	85–74	71–63	70–58	84–69	95–85	72–60	81–72	91–76
Final batch RM		85–75							85–70				
Extruding temperature, °F.	280	280	280	270	280	280	280	280	295	300	280	295	300
Physical Properties													
Modulus @ 300% E., p.s.i.													
30 min. @ 287° F.	820	860	820	950	635	1185	960	820	850	930	850	870	1165
60	1335	1285	1335	1500	1075	1725	1600	1335	1660	1405	1550	1705	1805
90	1645	1520	1645	1600	1145	1725	1785	1645	1800	1725	1650	1855	1935
Tensile strength, p.s.i.													
30 min. @ 287° F.	2560	2690	2560	2700	2760	2930	2340	2560	2800	2700	2275	2350	2725
60	3060	3110	3060	2675	3130	3280	2700	3060	2900	3030	2750	3070	2665
90	2930	2960	2930	2625	2810	3030	2760	2930	3100	3080	3160	2855	2835
Elongation, %													
30 min. @ 287° F.	630	650	630	590	765	550	515	630	635	585	585	620	585
60	540	565	540	450	620	490	420	540	455	505	455	480	410
90	475	470	475	430	580	440	430	475	450	465	485	410	400
Durometer hardness													
30 min. @ 287° F.	62	55	62	53	60	56	55	62	55	57	57	60	59
60	63	60	63	58	66	61	57	63	60	60	63	64	65
90	63	60	63	60	66	61	58	63	61	60	63	65	65
Rebound													
R. T.	55.9	54.4	55.9	58.4	56.0	57.4	56.9	55.9	52.5	52.5	55.9	56.4%	56.4%
212° F.													
Treadwear rating	100%	118%	100%	121%	100%	124%	118%	100%	114%	125%	100%	115%	110%

*GR-S black masterbatch.
†GR-S cold rubber black masterbatch.

cosity decreased appreciably during the later stages of compounding. This condition might be interpreted as a lower power consumption in the Banbury and a somewhat higher power requirement in the later stages, or a reduction in the peak power requirements. These effects are shown in Figure 10.

Several approaches have been made to this problem of improving the efficiency of mastication of the Krynol (XPRD-233) and carbon black in the first Banbury mix. None of these has been wholly satisfactory in achieving a good balance between polymer breakdown and peak power loads. One investigation, however, deserves mention, that is, the addition of a chemical plasticizer such as RPA No. 3. This was tried first in the factory with some success in increasing the rate of breakdown and producing a more coherent crumb in a Krynol (XPRD-233) and carbon black Banbury masterbatch.

The factory extrusion data showed that the Krynol tread stocks extruded at lower temperatures than the GR-S tread stock at the same Mooney viscosity level. It was found that Krynol treads for the test tires could be extruded through the same die as the control treads, and they were very close to the control in dimensions.

Factory tire building has been conventional. No special precautions are necessary to build a tire with a Krynol tread of either unit tread or cap and base construction. Some difficulty has been encountered with the splice opening up after the tire has been bagged. Best results have been obtained with cold bags and curing the tires as soon as possible after bagging. It is possible that this difficulty can be overcome by reinforcing the splice with a sheet material which can be removed just before the tire is inserted into the mold.

Tire Tests

Tires built in the factory from the various experimental polymers and commercial production of Krynol have been run on a test fleet in California, on a taxi fleet in the northern midwest United States, and on private cars. These tests have been conducted during all seasons of the year with temperatures ranging from —10° F. to 100° F. The compounding variables, factory processing data, physical properties, and tire test results are given in Tables 13 and 14.

TEST 2614. This test consisted of a comparison of a high Mooney viscosity polymer of 240 computed Mooney containing 60 parts of oil and 85 parts of black with a standard GR-S-black masterbatch. The results show the tough polymer to give an improvement of 18% in abrasion resistance.

TEST 2831. A comparison of a 135 Mooney viscosity polymer containing 55 parts of oil and 75 parts of black with a standard GR-S-black masterbatch was made. This polymer (XPRD-211) showed an improvement of 21% over the standard GR-S tread.

TEST 2845. A comparison of two high Mooney viscosity polymers of varying degrees of toughness *versus*

TABLE 14. COMPOUNDING VARIABLES, FACTORY PROCESSING DATA, PHYSICAL PROPRETIES, AND TIRE TEST RESULTS

Test No.	3101			3135		3179				
Polymers tested	XPRD-211	XPRD-211	XPRD-211	X-598*	Krynol	X-598*	X-628†	X-629‡	Krynol	Krynol
Computed Mooney	135	135	135	36	135	36	130	130	135	135
Method of mixing	dry mix	rubber-oil mixture	rubber-oil black mixture	cold rubber-black masterbatch	dry mix	cold rubber-black masterbatch	rubber-oil masterbatch	rubber-oil-black masterbatch	rubber-oil mix	rubber-oil mix
Variables										
Polymer	100	100	100	100	100	100	100	100	100	100
HAF Black	75	75	75	50	75	50	75	75	75	75
Oil	50	50	50	8	50	8	50	45	50	50
Accelerators	1.3	1.3	1.3	std.	1.4	std.	1.1	1.4	1.15	1.15
Sulfur	2.1	2.1	2.1	std.	2.0	std.	2.0	2.1	2.0	2.0
						..	..	..	..	0.5
Mixing Cycle, No. 1 1 BB										
Masterbatch	10 min.	5 min.	6 min.	5 min.	7 min.	5 min.	7 min.	7 min.	7 min.	7 min.
Second master										
Final batch	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.
RM	3 min.	3 min.	3 min.						3 min.	
Mooney Viscosity ML4										
Masterbatch	145–139	145–130	111–103	84–75	136–122	84–75	137–126	98–87	131–118	120–105
Second master										
Finish	110–104	97–86	91–83	78–67	96–85	78–67	84–74	63–56	102–90	85–76
Final batch RM	85–80	76–70	85–77						81–72	
Extruding temperature, °F.	275	270	275	285	280	285	270	270	270	270
Physical Properties										
Modulus @ 300% E., p.s.i.										
30 min. @ 287° F.	950	1225	975	875	1225	1000	725	800	975	1100
60	1600	1650	1500	1325	1750	1500	1375	1425	1400	1625
90	1500	1750	1625	1350	1900	1450	1400	1525	1500	1525
Tensile strength, p.s.i.										
30 min. @ 287° F.	2625	2825	3050	2650	3100	2675	2300	2125	2825	2950
60	2850	3150	2175	2725	2825	2400	2700	2300	2775	2125
90	2850	3200	2200	2775	2850	2675	2675	2250	3150	3200
Elongation, %										
30 min. @ 287° F.	595	525	600	720	580	640	640	590	600	600
60	510	480	410	540	450	450	500	430	470	350
90	475	470	420	570	410	500	480	400	500	480
Durometer hardness										
30 min. @ 287° F.	59	57	52	65	55	63	53	52	55	55
60	62	56	62	67	58	66	59	58	59	59
90	64	60	61	69	60	69	59	59	60	59
Rebound										
R. T.	52	56	58	56.9	54.9	58.	55.4	56.9	56.9	55.4
212° F.	68.1	72.3	75.2			65.1	68.4	70.7	71.8	71.2
Treadwear rating	100%	109%	100 5%	100%	116%	100%	107%	106%	127%	120%

*GR-S cold rubber black masterbatch.
†GR-S cold rubber–oil–masterbatch.
‡GR-S cold–rubber–oil–black masterbatch.

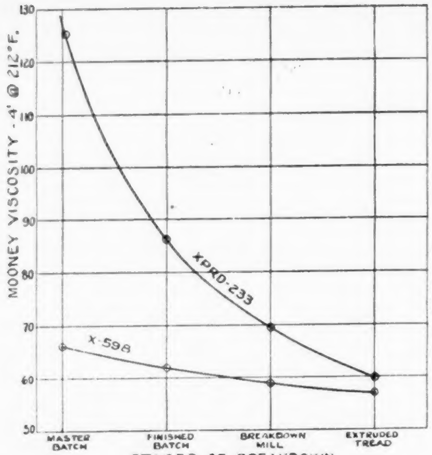

Fig 10. Variation of Mooney Viscosity of Krynol (XPRD-233) as Compared with GR-S X-598, during Milling and Processing

a cold rubber black masterbatch was made. The results indicate the tread wear to be superior for the experimental compounds by 18% and 24% over the cold rubber control.

TEST 2911. A comparison of a dry mixed and a latex compounded high Mooney viscosity polymer with a regular GR-S black masterbatch was made in this test run. In abrasion resistance the dry mixed high Mooney viscosity polymer showed 14% improvement; while the latex compounded polymer showed 25% improvement over the standard GR-S-black masterbatch control.

TEST 2914. This test shows that blends of regular GR-S and high Mooney viscosity polymers give improved tread wear ratings over the standard GR-S-black masterbatch control.

TEST 3101. This test is a comparison of the dry-mix *versus* a rubber-oil mixture (Krynol) *versus* a rubber-oil-black mixture. The polymer-oil latex compound was superior although the differences were not great.

TEST 3135. This test is a comparison of Krynol *versus* a cold rubber-black masterbatch. The tread wear ratings indicate the Krynol compound to be 16% better than the cold rubber control.

TEST 3179. This test shows a comparison of Krynol, GR-S-X-628, and GR-S-X-629 *versus* a cold rubber black masterbatch control. The results indicate that the X-628 and X-629 polymers give a slightly improved treadwear rating, while the Krynol compounds gave a substantial improvement in tread wear rating.

No failures owing to migration of the oil into the carcass have been encountered in any of the tires tested. The volatilization and migration of oil from the treads were investigated by acetone extraction of the treads returned from the test fleet. The data are presented in Table 15.

TABLE 15. ACETONE EXTRACTION OF TEST TREADS

	Acetone Extract (%)	
	Calculated	Found
Tire Test 2614		
(A) Control	8.6	10.8
(B) Exptl.	25.2	23.2
Tire Test 2845		
(A) Control	8.6	10.5
(B) Exptl.	19.3	17.1
(C) Exptl.	27.5	24.9

These results indicate that the loss of oil by migration or volatilization was not excessive. The adhesion of Krynol treads to natural rubber carcass was also measured on samples cut from tires returned from the test fleet. These tests showed the adhesion in the experimental tires to be equivalent to that found in the control tires. Several months' aging of these tires after returning from the test fleet has had no significant effect on tread adhesion. One may conclude, therefore, that the migration of the oil plasticizer is not serious in tire service.

Application in Mechanical Goods

This new polymeric material is not limited to use in tire compounds, but shows many useful properties in mechanical goods. The physical properties of 50 volumes of various fillers in Krynol (XPRD-233) are compared with those with Polysar S-50 (GR-S-50) in Figure 11. Higher tensile strength and elongation at break values were obtained for Krynol (XPRD-233) vulcanizates, and the Shore hardness and modulus at 300% were also lower for Krynol vulcanizates. These properties indicated that Krynol compounds of comparable physical properties could be produced with a higher filler loading than that employed with Polysar S-50.

Preliminary factory trials have already been carried out with excellent results on the use of the material in mechanical goods compounds. The production of high-quality mechanical goods stocks showed similar improvements in properties as those of tread-type compounds of Krynol. Krynol has shown an amazing capacity for fillers, and good processing stocks may be prepared with a considerable reduction in production costs. Intricate extruded articles have been produced from Krynol with better dimensional reproduction than has been possible with polymers other than natural rubber. The hot tear strength of Krynol vulcanizates is superior to that of Polysar S vulcanizates in mechanical goods stocks, and quite complicated molded contours may be stripped from the mold with a low percentage of defective articles.

Summary and Conclusions

Steps leading up to the commercial production of Krynol have been described. The polymer has a high Mooney viscosity, about 135 ML-4', which permits the addition of 40-45 parts of oil plasticizer by the latex compounding technique.

The highly plasticized polymer may be readily processed in the factory, although some problems, not of serious proportions, remain in the processing of Banbury masterbatches and in tread splicing prior to cure.

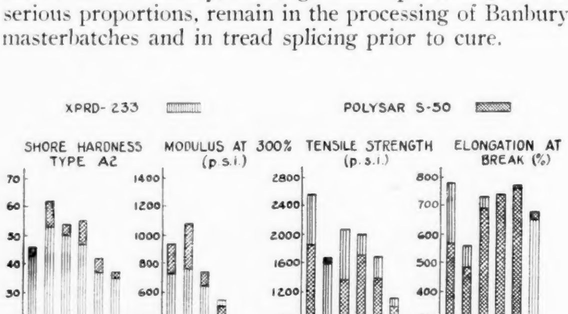

Fig. 11. Comparison of Physical Properties of Krynol (XPRD-233) and Polysar S-50 (GR-S-50) Compounds Containing 50 volumes of Various Fillers

Krynol tread stocks have equal tensile, higher elongation, lower modulus, and better flex-hysteresis in comparison with Polysar S (GR-S). The highly plasticized stocks are as resistant to change on heating in air as are Polysar S tread stocks.

Test tires with Krynol treads have shown better ratings than those of GR-S black masterbatch or cold rubber black masterbatch. Migration of the oil plasticizer to the carcass has not been found serious enough to affect tread adhesion.

Krynol can accept higher loadings of fillers and reinforcing agents than Polysar S in mechanical goods recipes.

Acknowledgment

The authors wish to acknowledge the permission of The General Tire & Rubber Co., and of Polymer Corp., Ltd., to publish this paper. The high molecular weight polymers and blends were produced in commercial quantities under the able direction of the technical staff of Canadian Synthetic Rubber, Ltd.

Natural Rubber Latex

(*Continued from page* 566)

tion to below 50% of the original total solids content results in a decrease in the mechanical stability of the resulting concentrate. It is perhaps more clearly shown by recentrifuging experiments in which the non-rubber solids may be reduced to a very low figure by repeatedly diluting the concentrates and recentrifuging.[10]

Figure 2 shows the inverse relation between seasonal rainfall and average feed total solids and also the direct relation between feed total solids and the KOH number of the resulting concentrates. Unlike the curves for these three properties, the seasonal curves for mechanical stability and viscosity show two distinct maxima and two distinct minima during the year. An examination of these curves reveals that an inverse relationship exists between the two properties. Thus although mechanical stability and viscosity exhibit an entirely different behavior in aging latex, in latices of the same age there is an inverse relationship between them. This will be brought out again in the discussion on clonal differences.

Obviously the two maxima in the mechanical stability curve cannot both be accounted for by rain dilution, but it can be seen that the maximum that occurs in September and part at least of the minimum which occurs in January may be attributed to this cause. The marked maximum which occurs in March and probably part of the January minimum then remain to be explained. The decrease from the September maximum toward the January minimum becomes marked about one month before the appearance of leaf coloration and continues through the loss of the leaves or the wintering season. The sharp rise from the January minimum starts with the first appearance of new green leaves. It thus seems obvious that the March maximum and part of the January minimum are closely related to the wintering and refoliation of the trees.

One theory which seems to have considerable merit is that during discoloration and prior to leaf fall the nitrogenous matter in the leaves moves back into the tree and raises the amount of such material in the latex. Then during the refoliation period the nitrogenous materials tend to be concentrated in the new leaves, leaving the latex low in nitrogenous materials. Since proteins and amino acids play an important part in determining the stability of a latex, such movements of nitrogenous materials may account for the changes in mechanical stability.

Since it is clear from this section that there are relatively large seasonal variations in latex properties, it is important that in searching for clonal differences comparisons should be made between latices collected at the same season of the year or, as is done in this paper, between average values for samples obtained at equal intervals over a period of at least a year.

(*To be concluded*)

[10] E. M. Glymph, unpublished report.

To Extend Brazilian Plantations

As a result of the crude rubber shortage, tire manufacturers at Sao Paulo, who were forced to shut down their factories 10 days last March, have been operating at 75% of capacity. The authorities, studying the situation, as a first step toward increasing the supply of rubber, have recommended that the Amazon Credit Bank import 9,500 metric tons of natural rubber in 1951, an amount which represents the difference expected between domestic production and consumption of natural rubber in Brazil this year. This recommendation has not satisfied the principal tire manufacturers, who have pointed out that the proposed imports are not sufficient to permit accumulation of stockpiles necessary to avoid future shutdowns; they foresee a serious tire shortage by the end of 1951, also because of the increasing quantities of tires demanded by the country's expanding transportation system.

The rubber manufacturing industry as a whole has been developing so rapidly that the government itself recognizes that Brazilian annual rubber consumption will probably reach 50,000 tons in two years, against present output of about 28,000 tons; consequently a permanent solution to the problem of supplies must be found. Recently the president of the Amazon Credit Bank revealed that the following measures for the extension of rubber plantations have been approved by the Ministers of Agriculture, Finance, and Labor:

A preliminary plan calls for planting 10,000,000 rubber trees over a seven-year period; 1,000,000 to be planted in each of the Federal Territories of Acre, Amapa, and Guapore; 2,000,000 to be planted for the Northern Agronomic Institute of Belem in several other sections of the Amazon region, and the remaining 5,000,000 to be financed by the manufacturers of rubber goods of Sao Paulo, Rio de Janeiro, and Rio Grande do Sul in any area they choose. The Minister of Agriculture will grant an appropriation of 8,000,000 cruzeiros and will send to the Amazon Valley three rubber technicians offered by Sao Paulo rubber manufacturers and two technicians from French Indo-China.

The Minister of Finance has authorized measures to provide the Amazon Credit Bank with adequate cash resources to aid the Bank's efforts to improve Amazon rubber production.

Finally, the Minister of Labor has authorized the National Department of Colonization and Immigration to establish an urgent plan to obtain workers for the Amazon rubber plantations. About 1,000 men are being contracted for the Belterra rubber plantations on the Tapajos River to tap about 1,000,000 mature trees.

Editorials

The Rubber Industry in 1960

THE latest issue of "Notes on America's Rubber Industry," this one entitled "Looking Ahead to 1960," by P. W. Litchfield, chairman of the board of the Goodyear Tire & Rubber Co., has aroused and will continue to arouse much comment and speculation in industry and government circles since it focuses attention on the need of forward planning beyond the two-year periods which have been the case in the recent past.

Litchfield estimates that world consumption of new rubber in 1960 will be between 3,300,000 and 4,000,000 long tons a year and consumption in the United States between 1,500,000 and 1,800,000 tons a year. He takes the position that no appreciable expansion in our potential supply of natural rubber is to be hoped for since there has been practically no increase in acreage of rubber trees for ten years, and because of political conditions in the rubber growing areas, no substantial expansion in acreage is likely in the near future.

There is only one solution to this problem, Litchfield says, and that is to expand greatly our facilities for the production of synthetic rubber.

At its meetings during July the Rubber Industry Advisory Committee to W. Stuart Symington, Administrator of the Reconstruction Finance Corp., reported "no substantial disagreement" with the position taken by Litchfield that the nation must prepare for a heavier demand for rubber in the coming decade by expanding its production of synthetics.

Also during July, *Natural Rubber News,* speaking for the natural rubber producers, stated that the answer to a major portion of the forecasted shortage lies in new plantings of *Hevea* trees and an intensive replanting of old trees by proven high-yielding replacements. It was emphasized that while the average yield in the present area is about 500 pounds per acre per year, proven high-yielding stock is now netting 2,000 pounds and over per acre per year.

We believe that there is a good possibility for new rubber consumption in the United States to reach an annual figure between 1.5 and 1.8 million tons by 1960 and a somewhat lesser possibility that world consumption will be between 3,300,000 and 4,000,000 by that time. Consumption in the United States will probably be more than 1.2 million tons in both 1950 and 1951. This latter figure may represent the maximum ability of the American industry to use new rubber with its present plant and chemical and textile component material supply.

It is this matter of plant, chemical, and textile component material supply that we believe will require equal attention to that necessary to assure ample supplies of both natural and synthetic rubber, if the heavy demand of the present decade is realized and rubber goods manufacturers are going to be able to meet this demand.

Plant expansions will have to be made and new machinery and equipment installed if the American industry is to meet a demand for rubber products that will cause them to consume 1.4, 1.6, or 1.8 million tons of new rubber a year.

Similarly, facilities for the production of chemicals and compounding ingredients will have to be increased. These materials, when used only to the extent of one part per 100 parts of rubber, mean 1,000 tons more must be provided for every additional 100,000 tons of new rubber consumed. Accelerators of vulcanization in 1948 were produced to the extent of 46.8 million pounds when new rubber consumption in that year amounted to 1,069,000 tons. Rubber consumption at a level of 1.5 million tons would require almost 66 million pounds of accelerators, and at the 1.8 million-ton level, accelerator demand would be 79 million pounds. These increases amount to 40 and 70% more than the 1948 accelerator production. Antioxidant production in 1948 was about 42 million pounds, and increases similar to those for accelerators would therefore be required. These two types of chemicals are used in amounts between 1.0 and 1.5 parts on 100 of new rubber, but many other compounding ingredients for rubber are used in much larger amounts. Additional supplies running into thousands of tons of some of these higher-volume materials would be needed if and when rubber consumption in this country reached 1.4 to 1.8 million tons a year.

Textiles and fabrics, especially rayon tire cord, have been in greater demand than the available supply for some time, and any further increases in demand during the next several years amounting to 25-50% more than the existing capacity to produce will necessitate some fairly prompt forward planning by producers of these components.

If new rubber consumption in the United States reaches 1.5 to 1.8 million tons in the present decade, production of new machinery, compounding ingredients, and other components will have to be increased proportionally. This situation will be a problem and a challenge to the supplier industries, but the rubber industry will have an almost equal responsibility to encourage and aid the supplier industries in planning the necessary expansion.

R. G. Seaman

DEPARTMENT OF
PLASTICS TECHNOLOGY

Plastisol Molding[1]

C. W. Patton[2]

PLASTISOLS were first used on a large scale in the United States in 1944 to fill voids in electrical cables for naval vessels. Subsequently they and, in particular, their allied dispersion vinyl resin products, organosols, have expanded very rapidly into the cloth coating field. Today a large, if not major portion of the fabrics used in the so-called artificial leather field is coated with organosols or plastisols.

Other important present-day uses for plastisols include coated materials for wall and floor coverings, venetian blind tapes, coatings for electroplating equipment and small-diameter electrical wire, coil impregnants, and molded automotive parts, ladies' and children's footwear, parts for dolls, puppets (see Figure 1), and novelties, and elastomeric industrial items.

Plastisol Molding Techniques

The rapid growth of molded plastisol articles naturally focuses attention on the techniques involved. Plastisol molding differs markedly from conventional injection and compression molding both in respect to processing and end-use products. In general, these differences result in equipment economies and diversification of end-uses for molded plastisol products. In fact, some present end-uses for molded elastomeric vinyls might well not be in existence were it not for certain processing possibilities inherent in plastisols. Thus, a clear picture of the plastisol processing technique is helpful in visualizing end-uses that can best utilize molded plastisol products.

Briefly, plastisol technique is just about the exact opposite of conventional molding. Conventional molding of elastomeric vinyl resin products proceeds essentially as follows. A powdery or finely grained resin is poured into a vessel; a plasticizer is poured into the vessel, and the two components then are mixed with the expenditure of a considerable amount of work and heat to insure the formation of a completely homogeneous mass which, upon cooling, has the same properties as are desired in the end-product. It is still necessary however, to granulate, dice, or preform the compound to facilitate feeding it to the molding machine or press. In the press it is necessary to apply heat and considerable pressure to get the compound to move into its final desired shape in a rather sturdily constructed mold.

Fig. 1. Puppet Heads Made by Plastisol Slosh Molding

In other words, conventional technique takes two materials that could be handled fairly easily and deliberately converts them into an extremely viscous mass which, although diced or granulated for intermediate handling, requires a lot of work to mold, in addition to the work expended in compounding.

The plastisol technique also starts with a powdered resin and liquid plasticizer, but the material is carried on through the process in essentially its original manipulable condition until the compound is in the mold where, by heat alone, it is homogenized or fluxed into its final physical condition and final physical state.

To elaborate further on plastisol processing and molding, a specially manufactured vinyl chloride-type dispersion resin of microscopic ultimate particle size is dispersed in a liquid plasticizer, much as paint pigments are ground into oils. In fact, similar paint-type equipment can be employed. The compounded plastisol, being pourable or at most a pasty material, can be either poured into the mold or sucked or pumped into the mold with a gear pump or other relatively low-pressure feeding device.

If a hollow article is desired and accurate control of wall thickness is not necessary, the excess plastisol compound can then be poured out, leaving only the material which clings to the mold interior. Since the pressures involved are either negligible or non-existent, sturdy or massive molds are not required. Lightly constructed cast and/or electroformed molds are eminently suitable, giving obvious mold economies.

The plastisol with which the mold has been filled or lined is converted to an elastomeric compound by raising its temperature to about 350° F. Once the requisite temperature is attained, the conversion or fluxing of the material is practically instantaneous. Upon cooling to about 140° F. the finished article may be removed. When the molded article is hollow, it is feasible to have deep undercuts, or to use a one-piece mold and still readily remove the article by collapsing it with a suitable tool and pulling it out. One-piece molds offer further economies, as well as the absence of mold lines, in the final product.

The fluxing process takes place rapidly because the ultimate resin particles in a plastisol are only a few microns in diameter at most, and so are dissolved immediately by the heated plasticizer. Fortunately, most of the commonly used plasticizers exert very little dissolving action on the resin at normal temperatures; so no special precautions are required to prevent premature fluxing.

Advantages of Plastisols

While many of the advantages offered molders by the plastisol technique are obvious, others are less apparent. For example, it was previously mentioned that the compounds could be prepared in paint grinding or mixing equipment. Partly as a result of this convenience, a number of paint manufacturers, particularly those specializing in vinyl resin coatings, have taken to plastisol compounding like a duck takes to water. They have, in general, a wide range of colors, fillers, stabilizers, and plasticizers available, also a considerable mass of data on the light, heat, and age stability, and other properties of various formulations on record.

Paint manufacturers have a good background on the development of various unique flow properties in materials. For example, many brushing paints are developed with thixotropic properties which give the material an apparently high viscosity that prevents the paint from flowing under its own weight when applied to vertical surfaces; yet at the same time the material is highly mobile under slight additional pressure. In some instances such properties are of value in plastisols used in "slosh" molding because a more uniform deposition of material is left on the mold's interior surfaces when the excess plastisol is poured out. In other cases a high degree of fluidity is desired, particularly when a mold is to be filled rapidly, or when a plastisol is poured into a preheated mold, and excess material must be removed quickly.

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[1] Presented before national technical conference, Society of Plastics Engineers, Inc., New York, N. Y., Jan. 20, 1951.

[2] Manager, coating and adhesive materials, thermoplastics department, Bakelite Division, Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

In general, paint manufacturers have various grinding and mixing devices, such as pebble mills, which can be used in dry grinding resin to give a range of particle sizes for specialized flow properties in plastisols. A number of firms have installed centrifugal and/or vacuum devices for deaerating plastisols because air bubbles worked into the material during compounding or subsequent handling will cause voids in the finished product.

To sum up, in addition to having a basically simple technique to master, the plastisol molder immediately inherits the color-matching and other specialized techniques and services built up by paint manufacturers over a period of years.

Since the plastisol technique is essentially a "fluidized" process, the production of highly plasticized rubbery end-products does not present the normal granulation and hopper feeding problems. In fact, the more highly plasticized plastisols are exceptionally easy to handle because of their great fluidity. Conversely, by selection of proper particle-size resin and blends of plasticizers it is possible to make pasty compounds containing 26% plasticizer which have a Shore durometer "A" hardness of about 100 after fluxing. It is also possible to increase hardness by loading the plastisol highly with fillers.

The relative fluidity of plastisols, as compared to conventional elastomeric molding compounds, greatly simplifies color matching. It is possible to take standard colors and mix up a pint or drum of material with simple stirring, using various colors added to produce the desired shade. Color problems are further simplified because the plastisol is exposed to high temperatures only during the relatively short fluxing period. Furthermore, sponging or foaming agents such as ammonium carbonate can be mixed in and not be gassed prematurely by elevated temperatures, as might be the case in conventional compounding.

The fluidity of plastisols makes it a simple matter to add materials such as luminescent pigments which would normally have their crystal structure damaged in high-pressure intensive compounding. Abrasive materials for step pads, etc., which would chew up conventional compounding equipment can be simply stirred into a plastisol. The fluidity also makes it possible to use delicate mold inserts that might be damaged or deranged by conventional molding.

It is also possible to use internal molds with no external parts by simply dipping the mold into plastisol, fluxing, and stripping the finished article off the mold or form. Various color effects can be obtained by multiple-dipping in various colors. This dip molding process has brought on a related technique where no mold as such is required. For want of an existing term, this technique has been dubbed "self-molding."

Items such as automotive light socket assemblies, normally protected by a molded cover or nipple that is slipped on after assembly, now have an individually tailored, removable cover made by immersing the assembly to the proper depth in a plastisol, removing, draining, and applying heat to flux the plastisol. Snug, dust, and water resistant fits are obtained even though there may be slight variations or defects in the parts so covered. This technique not only eliminates mold costs, but also the costs involved in removing forms from a mold, handling, and subsequent assembly of covers or nipples on to the sockets. Similar techniques are used for coating other products, including wire dish drainers (see Figure 2), sweater drying forms, etc.

Fig. 2. Plastisol Covered Wire Dish Drainer Made by Dip Molding

Physical Properties Obtained

In addition to the processing properties and possibilities, a wide range of physical properties is obtainable with plastisols. An indication of how these properties vary is given by a comparison of the properties of a series of simple plastisols after fluxing, all containing 1% of stabilizer, dioctyl phthalate as the sole plasticizer, and varying in dispersion resin content from 50-57%. The durometer "A" hardness of these plastisols goes up from 48-63; the tensile strength rises from 1,400-1,800 psi., and the elongation drops from 380-350%.

Special relations between hardness and elongation may be obtained by blends of plasticizers of different solubility characteristics. Plasticizers such as the polyglycol derivatives, which may not have sufficient dissolving action for use alone, may still be used in small amounts to increase the fluidity of the plastisol without much additional effect on softness of endproduct.

In connection with plasticizer effect on plastisol viscosity, some recent experimental work is of interest. A number of plasticizers were made up into plastisols wherein the resin to plasticizer volume ratio was kept constant. The viscosities of these plastisols were measured and compared with the viscosities of the plasticizers alone. There was practically a straight-line relation between the corresponding viscosities of the plasticizers and plastisols. This, together with work on the ultimate particle size and structure of dispersion resin agglomerates, indicates that many of the flow properties of plastisols are simply a matter of geometry and physical properties rather than of nebulous chemical interactions. This conception is altered, of course, when plasticizers are dealt with which may react with themselves and undergo further polymerization in the fluxing operation.

Summary and Conclusions

There are many additional technical aspects in the formulation and application of plastisols, such as the selection of pigments, fillers, stabilizers, mold release agents, bodying agents, etc., but in summation the plastisol technique is basically a simple one. A mixture of small particles of resin suspended in a plasticizer is readily moved into position in a mold and there, by heat alone, "compounded" or fluxed into its final physical state and shape.

By using a number of low-cost molds on a conveyer or turret set-up it is possible to obtain production rates that compare favorably with the output of an injection molding machine. By using only a few low-cost molds it is possible to write off mold cost even on comparatively small runs. This flexibility in processing, as well as the range of physical properties obtainable, makes plastisol molding a valuable adjunct for those now engaged in injection and compression molding. That it can be more than an adjunct is illustrated by the fact that plastisol molding has encouraged the entry and been the basis for success of newcomers to the molding field.

SPE Pin Design Contest

THE Society of Plastics Engineers, Inc., 490 Security Bank Bldg., Athens, O., is offering a prize of $50 to the individual submitting a design for the SPE membership lapel pin considered by the board of judges to be the best design and at the same time suitable for fabrication from a plastic material. Both amateur and professional designers are urged to submit to the Society a drawing and/or model of a pin that will also be suitable for use as a monogram on a ring and on the Society's stationery. Announcement of the winner will be made at the SPE National Technical Conference in Chicago, Ill., January 18-20, 1952. All entries become the property of the Society, and the decision of the judges will be final.

Miami Valley Picnic

The Miami Valley Section concluded the season with its annual summer picnic on June 29 at Terrace Park Country Club, Milford, O. Some 47 members and guests attended the outing, which included an afternoon of golf, softball, and horseshoes, followed by a buffet supper in the evening and the distribution of prizes.

Prize winners in the golf tournament follow: low gross, J. E. Baxter; and low net, B. F. Bain, F. L. Strobine, General Electric Co., and P. A. MacPhee, National Cash Register Co. The team of C. E. Weber and C. L. Ackerman, Crosley Division, Avco Corp., took first prize in the horseshoe tournament. Door prize winners were: C. M. Selz, Kurz-Kasch, Inc.; Al Pfau, Plastic Moldings Corp.; John and Joe Fiedler, both of F & F Mold & Die Works; R. W. Bice, Formica Insulation Co.; Wm. Gerdes, Plastic Moldings Corp.; and Harold LaCasse, Pennsylvania Salt Co. Mr. Barter was chairman of the arrangements committee and was assisted by M. F. Nelson and R. W. Gerdes, both of Plastic Moldings Corp., and J. W. Brierley, Bakelite Corp.

M.C.A. Plastics Committee

M. G. Milliken, Hercules Powder Co., has been named chairman of the plastics committee of the Manufacturing Chemists' Association for the coming year by the board of directors. Mr. Milliken succeeds D. S. Frederick, Rohm & Haas Co., who continues as a member of the committee. F. A. Abbiati, Monsanto Chemical Co., was named vice chairman of the Committee. Other committee members are E. D. Ries, E. I. du Pont de Nemours & Co., Inc.; J. L. Rodgers, Jr. American Cyanamid Co.; H. S. Bunn, Bakelite Co., division of Union Carbide & Carbon Corp; and John P. Coe, Naugatuck Chemical Division, United States Rubber Co. Bunn and Coe succeed Alan Mann, Catalin Corp., and J. R. Hoover, B. F. Goodrich Chemical Co.

Scientific and Technical Activities

ASTM Committee D-11 Atlantic City Annual Meeting

COMMITTEE D-11 of the American Society for Testing materials and most of its subcommittees met at Atlantic City, N. J., June 20, 21, and 22, as part of the annual meeting of the Society. The Committee D-11 meeting was held the morning of June 22, with Simon Collier, Johns-Manville Corp., chairman, presiding, assisted by Arthur W. Carpenter, B. F. Goodrich Co., secretary.

A dinner-meeting of the advisory committee and the subcommittee chairmen took place the evening of June 21. Subcommittee meetings occurred on June 20 and 21.

D-11 Meeting

At the meeting of Committee D-11, June 22, it was announced that J. D. Heide, United States Rubber Co., had accepted the chairmanship of subcommittee 28 on Statistical Quality Control and that the new chairman would submit in the near future a memorandum of his plans for the operation of this subcommittee. Members for this subcommittee were solicited with the proviso that these members have previous experience in statistical quality control work. Subcommittee 28 will aid other subcommittees of D-11 in planning their experimental work and analyzing data resulting from such work.

Delegates to the meeting of the International Organization—Technical Committee 45 on Rubber, to be held in Oxford, England, October 1 through 5, will be R. S. Havenhill, St. Joseph Lead Co., and R. D. Steihler, National Bureau of Standards. Havenhill and Steihler will be delegates of the American Standards Association, the participating organization of the international body. This meeting will be preceded by a symposium, "Modern Rubber Testing," sponsored by the Institution of the Rubber Industry, scheduled for September 28 in London.

H. G. Bimmerman, E. I. du Pont de Nemours & Co., Inc., will continue as chairman of the committee to nominate members of D-11 for the ASTM Award of Merit.

It was decided that D-11 would not have representation on Committee E-12 on Color or on the Corrosion Committee.

R. E. McCurdy, Hood Rubber Co., resigned as D-11 representative on subcommittee 9 on Softening Point of Committee E-1, and was replaced by Mr. Harriman of the same company.

B. S. Garvey, Jr., Sharples Chemicals, Inc., stated that the Library Committee of the Division of Rubber Chemistry of the American Chemical Society would like to cooperate with Harry L. Fisher, chairman of subcommittee 8, on Nomenclature and Definitions, of D-11.

It was decided to await a statement of the scope of the new ASTM Committee E-10 on Radioactive Isotopes before appointing a representative from D-11 for this committee.

The procedure for issuing emergency alternates of the ASTM specifications has been reactivated because of the defense mobilization program,.

Subcommittee Meetings

Subcommittee 3—Tests on Thread Rubber. J. J. Allen, Firestone Tire & Rubber Co., chairman. No meeting of this subcommittee was held, but the chairman reported that a second round-robin test, planned to check discrepancies found in the first round-robin using Method B, Stress-Strain Properties with Fixed Elongation, as published, and by the inclined plane machine method, was not carried out owing to the pressure of work in connection with the national mobilization.

A questionnaire has therefore been circulated to collect information based on actual laboratory results, with "Proposed Methods of Testing Rubber Thread," as published in the "1951 ASTM Standards on Rubber Products."

Subcommittee 4—Protective Equipment for Electrical Workers. Gordon Thompson, Electric Testing Laboratories, Inc., chairman. No meeting of this subcommittee took place, but the chairman reported that since the last meeting the section of 11 members which has been working on a revision of the specification for rubber gloves for electrical workers, D 120-40, under the chairmanship of I. R. Dohr, has presented a draft of the revised specification. This draft was approved by the Accident Prevention Committee of the Edison Electric Institute at its meeting in Denver, Colo., on May 22.

The draft has been submitted to letter ballot by members of subcommittee 4, which also constitutes the sectional committee J-6 of the American Standards Association, with the result that 21 affirmative votes and one negative vote were received; one ballot was not returned, and one member registered as not voting. The revision of D 120-40 was therefore submitted to D-11 for approval as a tentative standard of ASTM.

Subcommittee 5—Insulated Wire and Cable. J. T. Blake, Simplex Wire & Cable Co., chairman. Changes in the values of physical properties of rubber insulators in jacketed cables and the stranding of cables for over 1,000 volts are now ready for approval by D-11, the chairman reported. Specifications for polyethylene and butyl rubber insulated wires are to be letter balloted by the subcommittee. Shielding practices were discussed fully.

It was decided that the group will develop a general specification for wire and cable construction which will allow other specifications to be simplified.

Subcommittee 6—Packings. F. C. Thorn, Garlock Packing Co., chairman. A revision of D 733, Methods of Testing Compressed Asbestos Sheet Packing, was presented to replace the present standard, which was reverted to tentative status at the meeting in March in Cincinnati, O. Changes consist primarily in paragraph 8, where the new Compression Recovery Test, D 1147-51T, is to be incorporated, and in omission of paragraph 11 on corrosion testing. It is recommended that the revised D 733 be submitted through Committee F-10, subject to letter ballot within D-11.

A report of the section on Relaxation Test Methods for Commercial Gasketing, headed by R. G. Farnum, of F. D. Farnum Co., was submitted which outlined an extensive test program.

Information by the American Instrument Co. on a new device for conducting compression and recovery tests, D 1147-51T, was distributed.

Subcommittee 7—Rubber Latices. G. H. Barnes, Goodyear Tire & Rubber Co., chairman. At the ISO meeting in Akron in October, 1950, several items in the mechanical stability test were agreed upon and covered in the form of resolutions put out by ISO [ISO/TC (Secretariat No. 71) 90]. These were reviewed, and Resolutions 156, 157, 159, 160, 162, 163, and 164 were approved, as written, and, where necessary, D 1076-49T, Specifications and Methods of Test for Concentrated Ammonia Preserved, Creamed and Centrifuged Natural Rubber Latex, were changed. With regard to Resolution 158, it was agreed to change the total solids to 55% and to do the necessary work to establish a new specification minimum. In connection with Resolution 161, it was agreed that glass containers would continue to be used.

It was decided not to make any changes at this time in the capillary tube method for determining viscosity, pending further experimental work.

Other minor changes in D 1076-49T, found desirable after the use of this specification for a year or more, were approved by the subcommittee. These changes were: (1) Paragraph 8 on total solids determination will now include approval for the use of ointment tins and aluminum covered dishes, as well as glass containers. (2) Paragraph 10c on total alkalinity now requires the use of individually weighed samples for check tests instead of aliquot parts by volume of a single original sample. (3) Paragraph 14 on KOH number has been changed to include in the title both KOH number and pH. As soon as possible specification limits for pH for the various latices will be added. It was further agreed that the temperature of the sample for these tests should be regulated to 22-25 C.

Subcommittee 10—Physical Testing of Rubber Products. L. V. Cooper, Firestone, chairman. The chairman stated that the letter ballot within the subcommittee on the use of a 40-inch per-minute jaw separation speed of the tensile strength testing machine, except in cases of dispute, had resulted in 36 affirmative votes and four negative votes. The secretary of D-11 reported that the balloting on the same matter within the full D-11 Committee had resulted in three negative votes and more than 80 affirmative votes.

The chairman then presented for discussion the effort made to get work started to find an acceptable method for taking mill roll temperatures. During the discussion it was brought out that the temperature of the stock on the mill was more important to most people than the temperature of the mill rolls. D. C. Scott, Jr., Scott Testers, Inc., was appointed to head up a section to investigate this problem.

A request for clarification of the intent of the word "median" in paragraph 7 of D 412-49T, Method of Test for Tension Testing of Vulcanized Rubber, resulted in the chairman being instructed to

refer this entire matter to the new subcommittee 28 on Statistical Quality Control, with the request that the paragraph in question be rewritten to the satisfaction of subcommittees 10 and 28.

The chairman presented tentative write-ups of D-15a, D-15b, and D-15c, Methods of Sample Preparation for Physical Testing of Rubber Products, and the proposed methods were reviewed in detail. The subcommittee voted to include in D-15a, the standard compounds, the standard recipes and the standard mixing specifications now being formulated by a section headed by A. E. Juve, B. F. Goodrich Research Center. M. E. Marks, Southern Alakali Corp, inquired regarding the lack of a standard compound containing a non-black pigment, and he was added to Mr. Juve's section where this matter of a non-black standard compound will be investigated.

The review of the D-15 methods will be continued at the Spring, 1952, meeting.

Subcommittee 11—Chemical Analysis of Rubber Products. W. F. Tyler, Goodrich Research Center, chairman. A brief discussion of sulfur analysis was held, and some preliminary data were presented by V. L. Burger, U. S. Rubber, indicating that the presence of lead does not interfere appreciably in the non-fusion method for sulfur. The National Bureau of Standards is still working on a combustion method for this analysis.

A discussion of the preliminary work done on revision of the method for the determination of free carbon revealed considerable interest in the method of Kolthoff and Gutmacher of catalytic oxidative degradation of rubber in chlorinated aromatic solvents. It was decided to combine this work with the work on obtaining a suitable rubber solvent for the separation of fillers from vulcanized rubber compounds.

A brief report was made of the activities of three committees of ASTM on which Dr. Tyler is serving as D-11 representative. These committees are: E-1, subcommittee 15 on chemical analysis; subcommittee 22 on hydrogen ion determination; and E-13 on absorption spectroscopy.

The next step to be taken in the testing program for methods of analysis of copper, manganese, and iron in crude natural any synthetic rubber and latices was discussed. A program has been outlined for a final round-robin testing program to determine the details of a method suitable for the needs of subcommittee 7, Rubber Latices; subcommittee 12, Crude Natural Rubber; and the general needs of subcommittee 11.

Subcommittee 12—Crude Natural Rubber. Norman Bekkedahl, NBS, chairman. The subcommittee was fortunate to have as its guest R. G. Newton, of the British Rubber Producers Research Association, who has recently been appointed coordinating officer for technically classified rubber by the International Rubber Research Board.

Dr. Newton presented to the subcommittee a report on the present conditions and the latest developments in the technical classification and testing procedures used in Europe and the Far East, as follows: (1) Differences were found to exist in results obtained from Mooney viscosity measurements on high viscosity rubbers when different rotors were used. (2) Storage-hardening of rubber complicates the present system of technically grading rubber by viscosity measurements unless some modification, such as a light premastication, is made in the procedure. (3) To obtain information on interlaboratory variation in Mooney testing, the British plan a monthly distribution of rubber samples to about 15 laboratories in Europe and the Far East and would like to have about three laboratories in the United States participate in this testing program. (4) Because of a lack of standardization in mixing schedules it is recommended that mixing be continued until a Mooney of about 40 is obtained. (5) The temptrature of curing was raised from 127 to 140° C. (6) The modulus testing was changed from a measurement at 600% elongation to one at 100%.

Dr. Newton explained that steps had been taken to provide much larger quantities of technically classified rubber and that 20,000 long tons in RSS #1 grade would be produced in Malaya and Indo-China during 1951, about 10,000 tons from each territory. It was expected that some 3,000 to 4,000 tons of this rubber would find its way to the United States, and the General Services Administration has agreed that the technically classified rubber should be routed to interested consumers and not be absorbed into the stockpile. Certain other RMA grades will be classified as soon as possible.

E. M. McColm, U. S. Rubber, who has recently returned from a several months' trip to the Far East, reported on an improved political situation in the rubber producing countries and on some of the problems connected with the technical classification of rubber. He emphasized the fact that if American rubber goods manufacturers want to obtain technically classified rubber, they should have their purchasing agents demand this type of rubber.

C. O. Miserentino, Dunlop Tire & Rubber Co., presented a report of the task group on the determination of dirt in rubber, headed by C. B. McKeown, Goodrich. Two fairly satisfactory solution methods have been developed, but further cross-checking of the methods is desired. A third method (visual) requires further study to determine its possibilities.

The important problem of sampling crude natural rubber previous to testing will be submitted to subcommittee 28 on Statistical Quality Control.

L. V. Cooper presented a progress report for his task group on compounding formulae and test procedures. The results of a round-robin test on physical strength testing indicated that interlaboratory agreement was very good for measurements on strain testing, only fair on modulus, and quite poor on tensile strength. Analysis of the data by Dr. Bekkedahl indicated that this variation in tensile strength was due to variation in ultimate elongation, probably caused by variations in technique in dieing out the dumbbell test specimens.

Mr. Cooper recommended that no change be made in the standard A. C. S.-I Crude Rubber Testing Formula, except that a masterbatch method of adding pigments and accelerator be used, and that each laboratory establish a deviation percentage for its testing based on the results obtained on the standard sample of natural rubber as supplied by NBS, if and when such standard sample is available.

R. H. Taylor, of the United States Department of Agriculture Guayule Experiment Station, was asked to serve as chairman of a task group to study viscosity measurements and processability of crude natural rubber.

It was decided to turn over all study of methods of chemical analysis of copper, manganese, and iron to subcommittee 11 on chemical analysis.

Subcommittee 15—Life Tests for Rubber Products. G. C. Maassen, R. T. Vanderbilt Co., chairman. L. E. Cheyney, Minnesota Mining & Mfg. Co., asked to be relieved of the chairmanship of section 1 on the aging of plastics, and Joseph Breckley, Titanium Pigment Corp., replaced him as chairman. R. C. Boyd, Bakelite Division, Union Carbide & Carbon Corp., and of Committee D-20 on Plastics, presented a progress report on the work being done to develop an oven for use in determining volatile loss from plastics. This project has now been turned over to Committee E-1, and it is hoped that equipment manufacturers will have something by way of design available by the end of 1951. R. D. Stienler will keep subcommittee 15 advised of progress.

Section 2 on the correlation of oven and shelf aging will make a report on four-year shelf aging results at the 1952 spring meeting since these tests will be made in November, 1951.

Section 3 on the unification of tests for natural and synthetic rubbers reported that a letter ballot on proposed methods conducted in subcommittee 15 resulted in 23 affirmative, one negative, and 16 not voting. The proposed methods will be submitted to letter ballot in D-11.

Section 4 on miscellaneous properties and their effect on life aging submitted a progress report by Gerald Reinsmith, U. S. Department of the Army.

Section 5 on ozone testing, Mr. Juve, stated that as a result of a favorable letter ballot, the new method has now been printed under the identification of D 1149-51T, Method of Test for Accelerated Ozone Cracking of Vulcanized Rubber.

Section 8 on revision of aging specifications to conform with D 412, G. N. Vacca, Bell Telephone Laboratories, Inc., chairman, stated that proposed changes will be circulated in subcommittee 15 for lettrr ballot.

Subcommittee 17—Tests of Hardness, Set and Creep, Sherman R. Doner, Raybestos-Manhattan, Inc., chairman. This section on low-temperature compression set, headed by W. N. Keen, Du Pont, stated that a proposed method of test is to be submitted for letter ballot and comments to subcommitee 17.

The section of stress relaxation, headed by C. K. Chatten, U. S. Department of the Navy, made a progress report which indicated that some specific data will be offered soon regarding stress relaxation test methods.

Mr. Maassen recently questioned the need of the parenthetical expression in Method D 395 on compression set "within the limits of the table in Section 11b." Since no tolerance is shown where the % compression set is specified in the table in Section 11b, E. G. Kimmich, Goodyear, recommended that subcommittee 17 letter ballot on the following proposal: (1) "Modify the table in Section 11b to show the actual thickness of the spacer bars ($\pm$0.001 in.) to be used for each hardness range shown. Show the "% Deflection" figures as approximate values. (2) Amend paragraph 6 to include, "For method B compression set on special sizes or shapes of specimens, the deflection shall be in accordance with the percentage values shown in the table in Section 11b."

G. F. Bush, G. F. Bush Associates, recommended that a section be appointed to study and report on the Wallace hardness meter.

Subcommittee 18—Flexing Tests. B. S. Garvey, Jr., chairman. The chairman

reviewed briefly the action taken at the Akron, October, 1950, meeting of the ISO.

Ross Shearer, Goodrich Research, submitted for his section a proposed revision of D 813-44T, Method of Test for Resistance of Vulcanized Rubber or Synthetic Elastomers to Crack Growth. The revision will be offered for letter ballot in D-11. It was decided not to combine this procedure on crack growth with the section of D 430, Methods of Dynamic Testing for Ply Separation and Cracking of Rubber Products, because of the difficulty in making a revision of the latter at this time.

Mr. Keen reported on the progress of his section with the revision of D 623-41T, Methods of Test for Compression Fatigue of Vulcanized Rubber, Method A, with the Goodrich flexometer. It was decided to eliminate the portion of the method using conditions of constant deflection. The inclusion of the truncated cone as an alternate type of specimen was approved.

Mr. Kimmich raised the question of the jurisdiction between subcommittees 18 and 27 on the use of the Sonntag machine when used to measure heat build-up and flex life. This question was referred to the advisory committee of D-11 for decision as whether responsibility should be assigned to one of the committees or should be handled jointly.

Subcommittee 20—Adhesion Tests. L. E. Cheyney, chairman. The chairman reviewed the various actions taken at the March, 1951, meeting in Cincinnati with respect to the requests and recommendations made by ISO Technical Committee 45 regarding D 413, Methods of Test for Adhesion of Vulcanized Rubber (Friction Test), and D 429, Methods of Test for Adhesion of Vulcanized Rubber to Metal. Some minor changes in nomenclature in D 429 and a cross-reference in D 429 to the use of D 413 for 180-degree strip testing have been included in the 1951 edition of the "ASTM Handbook for Rubber Products."

N. G. Duke, B. F. Goodrich Chemical Co., reported his preliminary findings on information available in the United States on the effects of temperature on ply adhesion and the effects of humidity on ply adhesion with synthetic textiles. Further suggestions as to sources of information on these subjects were offered by the subcommittee.

The chairman reported the efforts, thus far unsuccessful, to organize a working section for investigation of the effects of specimen size, aging period before testing, and speeds, with D 429. Several laboratories have volunteered to assist in this program, and the section should be organized in the near future.

Dissatisfaction has been expressed with Method A of D 429, but it was felt that consideration of any other changes should wait until after the results of the round-robin program are available.

Mr. Larsen, Lord Mfg. Co., discussed a modification of Method B of D 429 which allows the test to be run with a Scott tester. A more detailed report will be submitted at the next meeting.

The impact method of measuring adhesion as originated in England by J. M. Buist and W. S. J. Naunton, Imperial Chemical Industries, Ltd, is to be studied in at least four laboratories in the United States. The chairman pointed out that Mr. Buist has kindly supplied drawings of the apparatus used, and these drawings are available to anyone wishing to construct the apparatus.

Subcommittee 21—Testing of Rubber Cements and Related Products. J. F. Anderson, Goodrich, chairman. The chairman announced that D 816-46T, Methods of Testing Rubber Adhesives, has been revised and submitted to D-11 for letter ballot.

The new methods for testing adhesives for friction materials were discussed in the light of latest revisions dated May 15, 1951, and after minor changes were approved by the subcommittee. It was recommended that these methods be approved as a tentative standard by D-11 and published at the earliest possible date.

The task group assigned to the development of these methods has been asked to continue its activities for the purpose of developing further tests, as follows: (1) measurement of undercured bonds; (2) restudy of angular shear; (3) restudy of impact test; (4) development of a fatigue test.

Another section will soon be appointed to work on specification ranges for the methods now established.

C. R. Lupton, Bendix Aviation Corp., gave an interesting review of some work his company had done in the field of non-destructive testing of brake-lining bonds by ultrasonic measurements.

Subcommittee 22—Cellular Rubbers. H. G. Bimmerman, chairman. Since sections 1 and 3 on sponge rubber products and compression deflection apparatus were both under the chairmanship of C. S. Yoran, Brown Rubber Co., it was decided to combine the two sections as section 1.

Dr. Yoran reported for the sponge and cellular products group that since some of the tolerances on lengths and widths in the appendix of D 1056-51T, Sponge and Expanded Cellular Rubber Products, appeared to be out of line, changes in sponge rubber sheet and strip—over 18 inches to $\pm 0.5\%$, and sponge rubber in molded and special shapes, 3 to 18 inches to $\pm 1/8$-inch and over 18 inches to $\pm 0.5\%$, would be letter balloted in the subcommittee and in D-11.

A. F. Sereque, Sponge Rubber Products Co., stated that the specifications for expanded rubber needed to be tightened and perhaps new tests adopted. K. Ballief, Rubatex Division, Great American Industries, Inc., suggested study of a vacuum treatment modification of a water absorption test as proposed by L. S. Boke, Du Pont. Sereque and Ballief will investigate this method.

Ballief also suggested changes in the tolerance of die cut expanded rubber, and he and Mr. Sereque will review this matter and make recommendations.

The latter reported figures on tests he had run on Hycar PA and silicone sponge. Limits for these types will be submitted to Dr. Yoran for committee action.

Since a method for weather resistance of automotive compounds has been developed and will probably be approved by D-11, this method will be referred to in the general methods of D 1056.

Mr. Sereque reported that the inclusion of compression-set specifications in Table 3 of D 1056 made it very difficult to make a sponge to meet these requirements and also low-temperature service.

E. C. Svendsen, U. S. Rubber, reported for the sectional committee on foam and acquainted the subcommittee with the request of the Inland Mfg. Co. for tests for tensile strength, sunlight resistance, resilience, and cell size and uniformity. The disk method seemed to be in general use for tensile strength testing. R. H. Walsh, du Pont, reported on tests conducted on the Instron machine. Mr. Svendsen presented pictures of U. S. Rubber methods of running tensile strength tests by adhering the specimens to plywood panels and testing in a special jig on the Dillon machine. These methods all appear to be of value, but the subcommittee felt that variables such as density and structure had so much bearing on the results that a standard test method should not be written as yet. L. A. Wohler, Firestone, outlined a tear test method used by that company.

A study will be made of methods of testing resilience and of measurement of cell size and uniformity. With regard to the latter, it was stated that "finger prints" of the form could be made, and size, number, and shape of cells could be determined microscopically; however, more than one cut section should be used.

The weathering resistance of foam is poor, and consumers are so informed. A modification of the automotive weathering test, however, could be used.

G. Reinsmith had asked for a better method for running low temperature tests. Pictures illustrating apparatus used by U. S. Rubber and du Pont were exhibited. A section will study the time required for adding the weights in connection with freeze testing and will also review the suffix F requirements in Table I of D 1056 to see if they need revision.

Paragraph 17 of D 1056 should contain a statement similar to that in paragraph 24 clarifying the matter of height. The type of plate used for compression-set tests on sponge and foam does not require the same degree of polish as for solid rubber.

The measurement of the thickness of foam specimens needs study since the present gage exerts too much pressure on soft foam.

Subcommittee 23—Hard Rubber. C. P. Morgan, Vulcanized Rubber & Plastics Co., chairman. G. A. Kanavel, Vulcanized Rubber, presented a working program for the "Investigation of Variables Affecting Reproducibility of Tensile Strength and Elongation of Hard Rubber." A number of items were deleted as superfluous in light of the existing D 530, Methods of Testing Hard Rubber Products, and those items of importance and found directly responsible for variations found to date in all tests are to be investigated.

The problem of a suitable method for the determination of the elongation of hard rubber was presented by Mr. Allen, Firestone. One instrument will be built for trial.

D. E. Jones, American Hard Rubber Co., reported on the impact testing of hard rubber by both the falling weight and Izod methods. The asphalt section is studying the falling weight method and action by subcommittee 23 will await the results of these tests. A further series of tests with the Izod method will be run.

Mr. Morgan reported that tests are now being conducted on the hardness testing of thin sections of hard rubber, and results will be available shortly.

Subcommittee 24—Tests for Coated Fabrics. S. H. Tinsley, Vanderbilt, chairman. The section on abrasion reported that work with the Stoll abrader showed considerable promise, particularly as to reproducibility of results. Some dissatisfaction was expressed with the 2½ garnet paper abraidant, and it was felt that a more suitable paper would result in a more uniform wear pattern.

L. P. Graham, Chase & Sons, Inc., chairman of the section on scrub testing, reported that two new experimental du Pont scrub machines have been built by his company in accordance with the recently revised design and that initial

work with one of these machines showed good reproducibility of results on one type of coated fabric. This type machine did not prove equally suitable, however, for other grades and weights of coated fabrics. Efforts are to be directed toward modifications in the machine to adapt it for use on a wider variety of coated fabrics.

Sectional committees to investigate current methods for evaluating cold cracking and plasticizer loss of coated fabrics were formed, and these sections will coordinate their work with that already under way in Committee D-20 on Plastics.

Subcommittee 25—Low-Temperature Tests for Rubber and Rubber-Like Materials. R. S. Havenhill, St. Joseph Lead Co., chairman. F. L. Graves, American Cyanamid Co., and R. C. Boyd presented the latest Committee D-20 revision of D 746, Method of Test for Brittle Temperature of Plastics and Elastomers. The new revision contained changes suggested by subcommittee 25, and the revision was accepted as read. A. W. Carpenter requested that Committee D-20 give further study to the matter of hinge breaks.

B. G. Labbe, Universiy of Akron Government Laboratories, discussed the revision of D 1053, Method of Measuring Low-Tempeature Stiffening of Rubber and Rubber-Like Materials by the Gehman Torsional Apparatus, regarding incorporation of a specification of the torsion wire constants. He also discussed the method of used by the Government Laboratories and measuring the torsion constant of the wire by Goodrich. Mr. Reynolds, American Instrument Co., demonstrated the apparatus and method used by the company for measuring the torsion constant of the wire. A committee, headed by Mr. Labbe and including R. Shearer, Goodrich, and Mr. Reynolds, will prepare a method of measuring the torsion constant of the wires used in the Gehman apparatus.

Irving Kahn circulated the results of a survey questionnaire which showed that the T-R (temperature-retraction) test is being used by a large and increasing number of laboratories. A round-robin test on the T-R test has been completed and results will be given at the next meeting of subcommittee 25.

O. H. Smith, U. S. Rubber, gave a talk showing that large differences between TR-10 and TR-70 values clearly indicate crystallization in various rubber samples tested. For elastomers which crystallize, correlation between TR-70 (250% elongation) and compression set was shown to be good provided the compression-set test produced substantial crystallization.

Subcommittee 26 — Processability Tests. R. H. Taylor, chairman. Subcommittee 26 recommended the following items for revisions of D 927, Method of Test for Viscosity of Rubber and Rubber-Like Materials by the Shearing Disk Viscometer, be submitted to letter ballot in D-11:

(1) Paragraph 6a—Delete the last sentence, and change the next to last sentence to read, "Allow the test piece to warm in the viscometer for a specified time, and then start the motor."

(2) Add the following new paragraph: "6b. Count the times from the instant the platens and closed, and record the time the test piece is allowed to warm in the machine before starting the motor."

(3) Insert the following note: "The temperature gradients and rate of heat transfer will differ somewhat from one machine to another and particular if different types of heating are employed. It may therefore be expected that the viscosity values obtained for a rubber tested on different machines will be more comparable if taken after temperature equilibrium of the test piece is attained. This usually occurs about ten minutes after the machine is closed on the test piece.

"For most rubbers the viscosity value obtained will not be altered appreciably by permitting the test piece to warm in the machine for different times provided the viscosity is read at a specified time. However, for unknown rubbers, a one-minute warm-up is recommended. The running time should never be less than two minutes."

(4) Change the note under paragraph 7 to read as follows: "50-ML, 212°F. at 1-5 min. where 50-M is .... temperature of test and 1 is the time the specimen was permitted to warm in the machine before starting the motor and 5 is the time of reading." [Not all the mechanical editorial changes were included in this report, but the essential items have been recorded. —EDITOR]

R. G. Newton stated that the Mooney viscosity alone does not give sufficient information regarding the processability of crude natural rubber and requested that other methods be developed.

Subcommittee 27—Tests of Resilience. E. G. Kimmich, chairman. D 945, Methods of Test for Mechanical Properties of Elastomeric Vulcanizates Under Compressive or Shear Strains by the mechanical Oscillograph, (Yerzley Oscillograph Method), has been questioned as to the constant in the shear modulus equation which should be 105 instead of 185 and the effect of creep on resilience, as calculated. It has been found, in cases of high creep, that the calculated resilience varies considerably, depending upon which of several successive half cycles is used. The opinion of the subcommittee on these matters will be obtained by letter ballot.

The suggestion that a standard method for the use of the Bashore resiliometer be prepared was deferred until there is more need of such standardization.

The force vibration method section under J. F. McWhorter, Ohio Rubber Co., reported progress in studying the apparatus now in use and will draft standards for measurement of resilience and related properties of laboratory specimens and production parts. Some present users of such methods combine resilience tests with fatigue testing. A request has been made to subcommittee 18 to consider additional methods of fatigue testing appropriate for this purpose.

It has been found that 15-degree initial swing in the pendulum rebound test method, D 1054, is too much for compounds above 70 durometer hardness, resulting in too much loss of energy due to vibration. Changing the angle to 10 degrees for compounds 70-90 durometer hardness and to 7½ degrees for compounds 90-96 durometer hardness, and indicating that the method is not suitable for compounds above 96 durometer hardness, will be letter balloted in the subcommittee.

Subcommittee on Standard Samples. A. E. Juve, chairman. Two proposals for establishing a source of standard natural rubber are now under active consideration by the Bureau of Standards. The first involves the preparation of the rubber by spray drying latex, previously stabilized with formaldehyde and creamed once or twice. E. M. McColm has agreed to arrange for the preparation of two bales of this type rubber which may have been received in this country in June or July.

The second proposal involves Banbury blending of a lot of #1 RSS, preferably of the yellow "O" grade of technically classified rubber, since this grade represents the central grade for both plasticity and cure rate. Since this technically classified rubber being prepared under the sponsorship of the International Rubber Research Board will presumably be tested at the plantation and will have properties within relatively narrow limits, the prospects should be fairly good that a subsequent lot of the same rubber, blended in the same way, would duplicate quite closely the characteristics of the first lot.

One of the goals of the subcommittee is to have the standard recipes, the standard materials, and the compounding and mixing procedure suitable for the preparation of standard batches incorporated into a tentative method which would replace that portion of D 15 concerned with these steps. To this end a suggested draft of such procedures has been submitted to the chairman of subcommittee 10 for the consideration of that subcommittee.

SAE-ASTM Technical Committee on Automotive Rubber. H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Co., chairman. Section 1 on automotive vibration insulators has completed preparation of a "Tentative Classification of Elastomeric Compounds for Resilient Mountings," and this classification is now being letter balloted in the technical committee.

Section 3 on automotive hose has prepared a tentative revision of the SAE R-24 curved hose specification to include standards for butyl hose. The tensile and the elongation limits are the same as those for GR-S hose. The use of an aging condition of 70 hours at 250°F. satisfactorily defines butyl hose by limiting the change in elongation to —60%.

Section 4 on Classification of Automotive Rubber Compounds now has 18 subsections. Sub-section 4A on abrasion has prepared a report on "Factors Affecting the Duplicability of Tire Road Wear Testing." A second report on "Factors Affecting the Duplicability of Laboratory Abrasion Testing" is being prepared.

Sub-section 4B on mats has completed all the work on an Automotive Mat Specification.

Sub-section 4D on Revision of Tables has completed the work on the 1951 revision of D 735, Specifications for Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications, and the new tables are published in the 1951 ASTM D-11 Handbook.

Sub-section 4E on Staining has completed its work on D 1148, "Method of Test for Discoloration of Vulcanized Rubber—Organic Finish Coated or Light Colored," and this method is also in the 1951 D-11 Handbook.

Sub-section 4I on Rubber-Like Plastics has practically completed its first specification, which is being letter balloted in the technical committee.

Sub-section 4L on Low-Temperature Properties has prepared a report defining "Types of Tests for Determining Low-Temperature Properties of Automotive Rubber Compounds," and this report is also being letter balloted in the technical committee.

Sub-section 4O on Silicone Elastomers has completed a set of specification tables for automotive silicone compounds, which is being letter balloted in the technical committee. These tables include reference to the former low-temperature brittleness test D 736-46T, and the technical committee requests that D11 consider the rein-

statement of this method to active status.

Sub-section 4P on Static Exposure Testing has prepared a "Tentative Method of Test for Weather Resistance Exposure of Automotive Rubber Compounds," which is being presented in the annual D-11 report.

Section 6 on Automotive V-Belts is working with the Armed Services in connection with V-Belt Specification MIL-B-11040.

Section 10 on Automotive Gaskets has prepared a "Tentative Specification for Gaskets for General Automotive and Aeronautical Purposes," and this specification is also presented in the D-11 annual report.

D-20 on Plastics

ASTM Committee D-20 on Plastics and its subcommittees held their annual meeting June 19-21 at the Chalfonte Hotel, Atlantic City, as part of the annual meeting of the Society. Gordon M. Kline, NBS, chairman, presided and was assisted by Bruce L. Lewis, Tinius Olsen Testing Machine Co., secretary.

Advisory Committee Meeting

The D-20 advisory committee met during the afternoon of June 20. On the occasion of his retirement from active industrial work, H. W. Paine, of du Pont, was made permanent honorary vice chairman of D-20 because of his long association with this committee.

M. E. Marks, Southern Alkali Corp., was appointed chairman of the committee to nominate a member of D-20 for the ASTM 1951 Award of Merit. Robert Burns, Bell Telephone Laboratories, received this award in 1950.

The first meeting of International Organization for Standardization—Technical Committee 61, Plastics, will be held September 17 and 18 in New York, it was announced.

The next meeting of D-20 will be held at General Brock Hotel, Niagara Falls, Ont., Canada, during the week of November 12.

Committee D-20 Meeting

The meeting of Committee D-20 was held the afternoon of June 21, and in addition to the items discussed by the advisory committee, subcommittee reports were heard and three papers on plastics presented. The titles and the authors of these papers were:

Properties of Exposed and Unexposed Polyvinyl Butyral Coated Fabrics. M. I. Landsberg, T. J. DiFillippo, L. Boor, Philadelphia Quartermaster Depot, Department of the Army.

Creep Test Methods for Determining Cracking Sensitivity of Polyethylene Polymers. J. D. Cummings and W. C. Ellis, Bell Telephone Labs.

Creep Relaxation Relations for Styrene and Acrylic Plastics. J. Marin and Yoh-Han Pao, Pennsylvania State College.

Subcommittee Meetings

Subcommittee 1—Strength Properties on Plastics. M. E. Marks chairman. D 695, Method of Test for Compressive Strength of Plastics, revisions are being sent to a letter ballot in D-20. These revisions include changes in the size of the specimens and in other details intended to clarify the method. The subcommittee is trying to correlate the method with that used by NEMA. The so-called skiball test for impact strength is being tested in a round-robin by four companies. D 256, Methods of Test for Impact Resistance of Plastics and Electrical Insulating Materials, is being revised by placing a specification on the clamping pressure so that styrene plastics can be more accurately tested. It is also proposed that the center section of the tensile specimen be allowed as an impact specimen in order that one mold can be used in preparing specimens. In the case of styrene plastics the specifications on tolerances of the radius of the cutting tool will be decreased to ±0.0005- inch.

The section on dynamic properties has prepared a very comprehensive table on available methods for determining the dynamic properties of plastics, and this list is being reviewed to determine the best methods for use with plastics.

Plans are being made to set up a program and devise methods for determining the properties of thin films, especially those used in the packaging industry.

D 952, Method of Test for Bond Strength of Plastics and Electrical Insulating Materials and D 1043, Method of Test for Stiffness Properties of Non-Rigid Plastics as a Function of Temperature by Means of a Torsional Test, were approved by the subcommittee to be advanced to the status of standard methods. A newly devised test for bursting strength was made a tentative method.

Subcommittee 2—Hardness Properties of Plastics. L. W. A. Meyers, Tennessee Eastman Corp., chairman. The subcommittee has been asked to prepare a chart correlating the various Rockwell hardness scales, but W. A. Zinzow, Bakelite Division, Union Carbide & Carbon Corp., indicated that the preparation of such a chart might be extremely difficult. The Barcol hardness test is being used by a number of plastics companies to obtain the degree of cure for all types of plastics and laminates. A section was organized to determine the feasibility of standardizing the Barcol testing method.

A bibliography and summary are being made on the scratch resistance test by Mr. Lewis. D 1044, Method of Test for Resistance of Transparent Plastics to Surface Abrasion, is being tested in a comprehensive round-robin. The determination of wear resistance by various types of machines is also the subject of a round-robin testing program.

Subcommittee 3—Thermal Properties of Plastics. E. B. Cooper, du Pont, chairman. A new method for the determination of the cubical expansion of plastics has been devised. The flammability test of the Society of the Plastics Industry, which has been tested quite thoroughly by that organization, is being written up as a tentative ASTM method.

The new extrusion method for determining the flow of thermoplastics is undergoing a round-robin test. This method involves extruding a rod of the material through an orifice under a constant load and weighing the extruded plastic; it has been particularly useful for determining the flow properties of polyethylene.

The subcommittee is considering undertaking the preparation of a new method for determining the specific heat of plastic materials as requested by the industry.

Subcommittee 4—Optical Properties of Plastics. H. K. Hammond, NBS, chairman. It was shown that luminous transmittance can be determined by the use of the integrating sphere except when the plastic materials are very dark colored with colors of purple or red. The present haze method, D 1003, is being revised so that Taber samples can be accommodated. There was considerable discussion of gloss and goniphotometry. NBS has a new method which uses statistical analysis to define the gloss characteristics of plastic materials.

Subcommittee 5—Permanence Properties of Plastics. J. W. Mighton, Dow Chemical Co., chairman. The determination of weathering properties of plastics by D 795 is being revised to include the sources of supply of the instruments used. The Bureau of Ships exhibited several samples of plastics weathered in locations from the tropics to the Arctic. NBS revealed information on the use of fluorescent ultra-violet lamps for weathering plastics.

A new method for determining volatility by the use of activated charcoal is being letter balloted in the subcommittee. The new method, which gives details for the construction of an air oven for volatilization tests, is to be designated method E because of its usefulness to a number of other committees in the ASTM.

Annual Report Actions

The new tentative methods recommended for adoption and new standard methods presented for the annual report follow:

Since round plastic tubing is often subjected to internal hydrostatic pressure a Tentative Method of Test for Bursting Strength of Round Rigid Plastic Tubing, was recommended for adoption.

There is a definite need of measuring warpage in sheet plastic specimens due to dimensional distortion resulting from exposure under service conditions, and a Tentative Method of Test for Measuring Warpage in Sheet Plastics has been devised that is also recommended for adoption.

A Tentative Method of Test for the Determination of the Apparent Density and Bulk Factor of Granular Thermoplastics is being recommended since in use at the present time is a similar method for non-pouring molding powders.

The committee recommended revisions in the following tentative methods:

1. D 704-44T, Tentative Specifications for Melamine - Formaldehyde Molding Compounds. Delete 13,000 under Type 6 under flexural strength in Table 1 and change to 11,000.
2. D 709-49T, Tentative Specifications for Laminated Thermosetting Materials. Changes were recommended to meet the requirements of the trade as well as the government.
3. D 647-49T, Tentative Specification for Molds for Test Specimens of Plastic Molding Materials. A design of compression mold for phenolic materials as well as changes to permit the use of more readily obtainable thermometers was recommended.
4. D 955-48T, Tentative Method of Measuring Shrinkage from Mold Dimensions of Molded Plastis. The additional use of the four-inch diameter compression molded specimen was included.
5. D 883-49T, Tentative Definition of Terms Relating to Plastics. Several new definitions and also definitions prepared by Committee D-14 applicable to plastic materials were recommended.
6. D 956-48T, Tentative Recommended Practice for Molding Specimens of Amino Plastics.
7. D 958-48T, Tentative Recommended Practice for Determining Temperatures

of Standard ASTM Molds for Test Specimens.

The committee recommended the following six tentative standards be approved for reference to letter ballot of the Society for adoption as standard:

1. D 952-48T, Bond Strength of Plastics and Electrical Insulating Materials.
2. D 1043-49T, Stiffness Properties of Non-Rigid Plastics as a Function of Temperature by Means of a Torsional Test.
3. D 621-48T, Deformation of Plastics under Load.
4. D 1042-49T, Measuring Changes in Linear Dimensions of Plastics.
5. D 1046-49T, Transfer Molding Specimens of Phenolic Materials.
6. D 1041-49T, Maintaining Constant Relative Humidity by Means of Aqueous Solutions.

The committee recommended that the following standards be revised, as indicated, and accordingly asked for the necessary 9/10 affirmative vote at the annual meeting in order that the recommendations may be referred to letter ballot of the Society.

1. D 795-49, Standard Recommended Practice for Molding Specimens of Phenolic Materials. Revision would permit standard available thermometers to be used.

The committee recommended withdrawal of the tentative methods below:

1. D 672-43T, Tentative Method of Test for Haze of Transparent Plastics by Photo-electric Cell. This method is superseded by D 1003-49T, Tentative Method of Test for Haze and Luminous Transmittance of Transparent Plastics.
2. D 948-47T, Tentative Method of Test for Weight Loss of Plastics on Heating. This method is to be superseded by other methods.

XII International Congress, Elastomers and Plastomers Section Program

THE XII International Congress of Pure and Applied Chemistry will meet in New York, N. Y., September 10 through 13, following the meeting of the American Chemical Society the week previous. Section 4, Elastomers and Plastomers, has scheduled ten papers to be given September 10 at the Hotel McAlpin.

Chairman of section 4 is R. P. Dinsmore, Goodyear Tire & Rubber Co.; vice chairman is N. E. Van Stone, Sherwin-Williams Co.; and secretary is P. O. Powers, Pennsylvania Industrial Chemical Corp. Members-at-large of section 4 are: J. H. Dillon, Textile Research Institute; W. A. Gibbons, United States Rubber Co.; George W. Morey, Carnegie Institution of Washington; and Carlton H. Rose, National Lead Co.

Honorary chairman for the morning session of Section 4 will be K. H. Meyer, University of Geneva, Switzerland, and for the afternoon session G. F. Bloomfield, British Rubber Producers Research Association, Herts, England.

The program and abstracts of the papers to be given before the Elastomers and Plastomers Section follow:

MONDAY MORNING—SEPTEMBER 10
Blue Room, Hotel McAlpin
K. H. Meyer, Honorary Chairman
R. P. Dinsmore, Presiding

10:00 a.m.—1. **Abrasion Resistance of GR-S Vulcanizates.** J. W. Adams, J. A. Reynolds, W. E. Messer, L. H. Howland, U. S. Rubber, Naugatuck, Conn.

A method for determining the abrasion resistance properties of reinforced vulcanizates was required for evaluating new GR-S-type elastomers and carbon blacks developed for use in automobile tire treads. Despite the fact that past experiences revealed most laboratory machines unsatisfactory for testing GR-S vulcanizates, a program for evaluating several machines was undertaken. A Lambourn abrader (Dunlop Rubber, Ltd., England) appeared most promising, for which reason efforts were expended on constructing a similar machine from parts available in the United States. The abrader built and operated to simulate wear brought about by a tire slipping on road surfaces embodied several modifications of the English model.

Data obtained from testing vulcanizates on the modified Lambourn abrader established that it was better than most laboratory devices for determining the effect of carbon blacks, elastomers, and other compounding variables on abrasion resistance properties as compared to tire tread wear resistance. More specifically, in the field of evaluating GR-S stocks, a partial solution of the often-termed "hopeless problem" of rating different vulcanizates with regard to wear was evidenced in the results.

10:30 a.m.—2. **The Rubber Hydrocarbon in Freshly Tapped *Hevea* Latex.** G. F. Bloomfield.

Solutions of the rubber hydrocarbon in the latex of *Hevea brasiliensis* can be conveniently obtained by allowing latex to flow from the tree directly into benzene or into a vistex solvent mixture. The hydrocarbon in such solutions is shown by osmotic and viscometric measurements to be of high average molecular weight, but with a broad distribution from several million to below 100,000 with the major portion in the higher molecular weight range. Small proportions of soft plastic fractions of low molecular weight (below 100,000) isolated in fractional precipitation or diffusion processes contain small amounts of combined oxygen (less than 1%), even when latex is extracted from the tree under conditions precluding access of air.

Considerable differences in average molecular weight are found between trees, and although significant differences are also observed between days within given trees throughout the course of observations extending for over a year, there are no indications of significant trends in molecular weight during period of biological activity such as refoliation.

Although in a number of cases intrinsic viscosity can be correlated with plasticity of different rubbers, such wide deviations occur from this correlation that intrinsic viscosity cannot be used as a reliable indication of plasticity. Methods of determining plasticity appear more sensitive to the effect of structure (in the sense of regions of cross-linking) than is intrinsic viscosity. True microgel structure in which cross-linking is confined to the individual latex particles renders rubber very hard, but may have little effect on the intrinsic viscosity, and although the hydrocarbon in fresh latex passes into solution readily on shaking, static diffusion into petroleum ether reveals the presence of microgel, the proportion of which is greater in hard rubbers than in soft ones.

The discovery that the latex in some untapped or long rested trees, and in the branches of some trees in regular tapping, contains a high proportion of microgel enables the area of bark affected by tapping to be defined since, when an untapped tree is brought into production, the microgel latex distributed over a considerable area of the tree is replaced by normal latex. There is a tendency for the tapping of high-yielding trees to affect the latex over a greater area of the tree than in low yielders.

When a tree containing microgel latex is brought into tapping, the intrinsic viscosity of solutions of its latex increases progressively although the rubber becomes softer. If two tapping cuts are opened on the same tree, the latex drawn from the upper cut gives much harder rubber than that from the lower cut although the intrinsic viscosities of the rubbers from the two cuts are similar. Differences in non-rubber constituents are also found in the latices from the two cuts; the lower cut latex contains more phosphorous and potassium, but less magnesium than the upper-cut latex.

11:00 a.m.—3. **Breakdown of Synthetic Elastomers in a Banbury Mixer with Added Air.** M. H. Reich, W. K. Taft, R. W. Laundrie, Government Laboratories, University of Akron, Akron, O.

The importance of sufficient oxygen for plastication of low-temperature polymers has been demonstrated in investigations conducted at the Government Laboratories, University of Akron. Air was introduced into a laboratory Banbury (size B) at a high loading (1475 grams of polymer; about 95% capacity) during the treatment of GR-S polymers X-478, X-510, and X-530, which had been prepared at 41° F. By this means, the low-temperature polymers were broken down at rates comparable to those for GR-S and GR-S-10 that had been treated similarly without air. The effect of the treatment upon the processing and physical properties of the air-softened stocks was similar to those obtained by the usual Banbury treatment of GR-S and GR-S-10.

High viscosity GR-S polymers (XP-99, X-538, and X-540; Mooney viscosities of 101 to 156 ML-4) and carbon black-latex masterbatched polymers (X-537 and X-571; greater than 175 ML-4) made at 41° F., Buna S-3 (136 ML-4), Neoprene Type W (57 ML-4), and Perbunan 26 (92 ML-4) were also treated in the Banbury with added air. The raw Mooney viscosities of these polymers were lowered to approximately 35 to 55 ML-4 within 10 minutes. Whereas the gel content of X-540 and Neoprene Type W remained about the same (less than 5%), those of X-538, Buna S-3, and Perbunan 26 were reduced from an average of 29% to less than 10% and that of XP-99 was decreased from 49 to 33%. Generally, air treatment improved the mill processing and extrusion properties of the elastomers; the compounded viscosity decreased in most cases. The processability of the air-treated polymers of high viscosity was at least equivalent to that of untreated X-558 GR-S, a 71.5/28.5 butadiene/styrene polymer made at 41° F. to 53 Ml-4 viscosity. Consistent with the results of the

previous study, the tensile strengths, at 77° F., of unaged and aged specimens were generally lowered only slightly by air-Banbury treatment, but the flex life and hysteresis of unaged and aged specimens and the abrasion resistance properties did not deteriorate significantly. The net result has been to transform these high-viscosity polymers into processable stocks without sacrificing the high abrasion resistance and good tread stock properties inherent in the high viscosity polymers.

11:30 a.m.—**4. Oxygen Absorption studies of Synthetic Rubbers in the Presence of Metal Deactivators.** J. O. Cole and C. R. Parks, Goodyear, Akron.

Recent work on the aging of synthetic rubbers has conclusively demonstrated, from oxygen absorption studies on vulcanized polymers, that the presence of very small amounts of soluble iron compounds markedly increases the rate of oxygen absorption and hence is detrimental to physical properties. These results are of particular interest with respect to cold rubber, currently manufactured with polymerization recipes containing substantial amounts of iron compounds, which are contained in the final polymer.

The petroleum industry has achieved some success in minimizing the deleterious effects of copper and other metals on aging of gasoline by the addition of so-called "metal deactivating agents." These agents form stable chelate compounds with the metal which are not deleterious. Although only very limited application of this technique seems to have been made in the field of elastomers, it seemed worth while to determine whether such agents could be usefully applied for improving the aging of GR-S type copolymers.

The work being reported was restricted to unvulcanized polymers. Since soluble, heavy metals are to a large degree rendered inactive during the vulcanization process, the deleterious effect of metals is much less important in GR-S vulcanizates than in unvulcanized polymers. The stability of the GR-S polymers employed was evaluated by oxygen absorption measurements during accelerated aging at 100° C. in oxygen at atmospheric pressure. In all cases the deactivating agent was added in addition to standard antioxidants.

Preliminary experiments were conducted with three commercial samples of GR-S type of polymers. The samples were chosen on the basis of previous work which indicated a wide variation in stability believed to be associated with differences in the soluble, heavy metal content. The addition of 1% N,N'-disalicylidene-1, 2-diaminopropane as a deactivating agent resulted in marked improvement in stability for two polymer samples assumed to contain moderate concentration of soluble iron and/or other heavy metals. No improvement in stability was observed for the polymer assumed to contain a high concentration of soluble, heavy metals. By use of synthetic samples containing 10 ppm. soluble iron, added as ferretic stearate, it was found that a detectable improvement in polymer stability was obtained by addition of less than 0.1% N,N'-disalicylidene-1,2-diaminopropane, but a concentration of 0.25-1% was required to stabilize effectively the polymer. Similar results were obtained in the presence of soluble copper. From data obtained with synthetic samples containing more than 100 ppm. soluble iron it was apparent that effective stabilization of the polymer was not obtained at a deactivator concentration of 1%. It was concluded that the deleterious effects of moderate amounts of soluble, heavy metals, such as iron and copper, can be largely eliminated by use of deactivating agents. The possible value of deactivating agents at high metal concentration levels has not yet been established.

A semi-quantitative comparison of the relative effectiveness of N,N'-disalicylidene-1,2-diaminopropane as a deactivator for copper and iron was made at a soluble metal concentration of 10 ppm. in a GR-S-10 polymer containing 1.2% N-phenly-beta-naphthylamine as antioxidant. The deactivator was found slightly more active for copper than for iron.

Data on the effect of chemical structure on deactivator efficiency are reported. Compounds obtained by condensing amines with o-hydroxy aromatic aldehydes and O,o'-dihydroxy azobenzene derivates show deactivator activity for iron.

Monday Afternoon — September 10
Blue Room, Hotel McAlpin
G. F. Bloomfield, Honorary Chairman
W. A. Gibbons, Presiding

2:00 p.m.—**5. Studies of the Vulcanization and Structure of Polyacrylic Rubber.** S. T. Semegen, B. F. Goodrich Research Center, Brecksville, O.

Early approach to the vulcanization of polyacrylate rubber is discussed. Curing agents found and their effect on physical properties are noted.

This paper discusses strictly the mechanism of vulcanization of polyacrylate esters induced with sodium m-silicate, and to a less extent with lead oxide. Vacuum distillation at curing temperatures of the rubber, the rubber plus curing agent, and the cured rubber was conducted. Analysis of the distillates revealed evidence of alcohol liberation, probably through hydrolysis, culminating either in a Claisen-type condensation or hydrogen binding of the polyacrylic acid.

X-ray and electron diffraction methods were used to show main chain spacings, side chain spacings, neighbor C-C carbon spacing of some acrylates and methacrylates, including methyl, ethyl, propyl, isobutyl, and n-butyl.

Comparison of the side group and main chain spacings were made by X-ray of the various esters of polyacrylic acid and γ-carboxy pimelic acid, from methyl ranging to 2-ethyl hexyl. The patterns are strikingly similar. The side group spacing progresses uniformly from 7.6 Å for methyl acrylate to 12.4 Å for n-butyl.

The binding in polyacrylic acid and γ-carboxy pimelic acid is much stronger than that of the esters. Also, hydrolysis of the methyl acrylate leads to an increase in side group spacings.

Polyacrylic acid shows a marked change in structure when plasticized with water or alcohol. The hard, brittle acid becomes rubbery, while X-ray pattern indicates the strong hydrogen binding between side chains has been broken up by association with water or alcohol.

Vulcanization of polymethlacrylate showed by X-ray that the interchain spacing increased from 7.6 to 8.4 Å. A copolymer of methyl acrylate-acrylic acid (10%) plasticized with methanol showed a spacing of 8.6 Å, although the unplasticized copolymer was actually lower, at 6.7 Å. This shows the vulcanization to proceed by controlled hydrolysis followed by hydrogen binding. Such a mechanism should be sensitive to moisture in agreement with the fact that anhydrous sodium silicate will not vulcanize, and the cured polymers are affected by moist heat.

Slides are presented for the following X-ray diffraction patterns:

1. Polymethly acrylate
2. Polyethyl acrylate
3. Poly n-propyl acrylate
4. Poly n-butyl acrylat
5. Polyisobutyl acrylate
6. Poly 2-ethyl hexyl acrylate
7. Polyacrylic acid
8. Polyacrylic acid plasticized with water
9. Polyacrylic acid plasticized with methyl alcohol
10. Polyacrylic acid plasticized with ethyl alcohol
11. γ-carboxy pimelic acid
12. Trimethyl γ-carboxy pimelate
13. Triethyl γ-carboxy pimelate
14. Tri-n-propyl γ-carboxy pimelate
15. Tri-n butyl γ-carboxy pimelate

2:20 p.m.—**6. Synthetic Rubber Latex Developments.** L. H. Howland, V. C. Neklutin, R. W. Brown, H. O. Werner, U. S. Rubber.

This paper discusses new developments in cationic latices, volatile-base latices, and fixed base "cold" latices of the butadiene/styrene copolymer class

Concerning the acid side latices, some rather interesting products have been made at both high and low temperatures. The best of these uses a tallow amine salt as the emulsifier. Others have been made with rosin amine acetate emulsification.

Owing to requests from industry, several volatile-base latices have been made by both high and low temperature polymerization. The simplest to manufacture is one made to 49.5% solids at elevated polymerization temperature, which uses morpholine laurate emulsification. This can be stripped readily without causing floc formation.

The present demand for "cold" latices for foam sponge, tire cord treatment, certain dipped goods, and other applications demonstrates that "cold" latex is a major advance in the latex industry. Since the first production started in 1949, several new latices have been developed, some of which are made to 60% solids by heat concentration. An improved polyamine activated (iron free) formula has been developed which should permit higher production rates than obtained with the previous ferrous sulfide activated recipe. Several modifications of this have been devised to meet demands from the trade.

2:40 p.m.—**7. New Developments in Solid Phase Spectroscopy.** J. D. Sands and G. S. Turner, Polymer Corp., Ltd., Sarina, Ont., Canada.

Rapid methods of preparing samples for spectroscopic study in the solid phase are presented. These methods have proved effective for both qualitative and quantitative work in the elastomer field and should have a wide range of application.

Essentially, the technique consists of laminating or impregnating the substance under study between or into sheets of other materials which have a transparent region in the infrared. Among the latter are mica, silver chloride, and polyesthylene. Sample thickness is eliminated from calculations by using the ratios of absorption peaks, as measured from suitable baseline points.

One of the important applications of the technique is in the determination of acrylonitrile in nitrile-type copolymers. The time required for the entire analysis is 15 minutes, with a probable error of one numerical per cent.

3:00 p.m.—**8. Polymer Carbon and Its Derivatives.** W. O. Baker and F. H. Winslow, Bell Telephone Laboratories, Murray Hill, N. J.

Carbonization of organic matter is still one of the commonest chemical reactions, but it usually occurs either by partial oxidation (e.g., dehydration of cellulose or dehydrochlorination as in saran chars), as in charcoal making, or by vapor and liquid phase polymerization, as in carbon black and Glanzkohlen. Most polymers melt and volatilize on pyrolysis. Progressive dehydrogenation of solid, highly cross-linked hydrocarbon polymers, like polydivinylbenzene and polyvinylacetylene, however, can be effected in an inert atmosphere. On integral pieces, this is virtually chemical modification of a single giant molecule. Enough of the original carbon bond network survives the thermal chaos (up to 1200° C.) to retain the original gross form (even as filaments) of such polymers in the final pure "polymer carbon." With original cross-sections greater than two millimeters, however, pieces of polymer carbon may be cracked. Non-ideal yields, meaning loss of carbon along with hydrogen, set up stresses along with a large-volume shrinkage. Thus a unit volume of original polymer (say a small sphere) goes down to overall volume of 0.478-cubic centimeter (at 25° C.) after conversion to polymer carbon at 960° C., *without changing shape*. At the same time it loses 52% of its weight and its He gas, or absolute density goes up from 1.05 to 2.05. The true volume of carbon in the 0.478-cubic centimeter hence is about 0.25-cubic centimeter, and the pore volume is —0.23-cubic centimeter, or 48% of the final space in the carbon sphere. This empty space thus relates roughly to the amount of *volatilized* material; the atomic arrangement shrinks the total sphere size down just in proportion to the increase in atomic density. That is, the specific volume of the *matter* in a sphere decreases by 48%, while the apparent volume judged by diameter shrinkage goes down by 52%. Formation of aggregates of discrete graphite crystallites would not be expected to go this way.

These results, obtained on many individual spheres, emphasizes the continuity of valence bonds through the entire particle (microgel molecules). X-ray scattering of polymer carbon suggests cross-linked graphitic layers, leading to diamond-like hardness, reordering or true graphitization does not occur ta 2400° C.

Partially dehydrogenated derivatives form a series of organic electronic semiconductors. With about 23 C atoms per H atom, specific resistivity at 25° C. is 1.3 x 10^{-2} ohm cm. Absorption spectra show that the electrons in the original hydrocarbon are progressively loosened, with strong color changes.

Polymer carbon is significant technically for electrical, mechanical, and chemical uses of hard, refractory, electron-microscopically smooth, geometrically regular forms of carbon. Since original monomers are distilled, polymer carbon is spectroscopically pure.

3:20 p.m.—**9. Behavior of Elastomers at Small Torsions.** K. H. Meyer, A. J. A. van der Wyk, W. Gonon, University of Geneva.

A novel apparatus for the study of the mechanical behavior of cylindrical specimens of elastomers at very small torsions is described. Some results are given.

3:40 p.m.—**10. An Electrical Analog Method for Explaining Elastomer Behavior.** R. B. Stambaugh, Goodyear.

Mechanical models, made up of springs and dashpots in various combinations, have been useful in a conceptional way for representing the visco-elastic properties of elastomers. It has not been practical actually to construct such models and use them in an experimental way to study elastomeric respone to force. The benefits of such procedures can be secured by taking advantages of the mathematical analogy which exists between electrical networks made up of capaictors, resistors, and inductors and the corresponding mechanical systems of springs, dashpots, and masses. The electrical system permits great flexibility in the construction of models because of the wide ranges of components available and the switching arrangements possible. Furthermore the time scale for the response of the model may be expanded or compressed, and the nature and the magnitude of the forces applied are nearly unlimited.

Apparatus has been assembled for setting up the electrical analog of simple linear or non-linear mechanical models. The associated equipment for exciting the model and analyzing the resulting "action" consists of a force generator providing step-function or alternating voltages and an integrating amplifier which measures the "deflection" or electric charge on the model by integrating the current flow into it. The output of this amplifier is observed on a 12-inch cathode ray tube screen in the form of a plot of the model motion as a function of time and force. Additional equipment permits repetitive excitation of the model and means of checking the calibration of the equipment. The display screen is photographed for permanent records.

Typical models are described. A creep for a model of GR-S tread stock, obtained in a fraction of a second, represents the creep observed in the actual stock in a period of 1,000 hours. A stress-strain curve from a model of natural rubber stock is shown to illustrate the use of non-linear model elements to reproduce the complete curve more accurately. The performance of rubber under vibrational forces has also been studied by this method. The possibility of applying to a model complicated force-time relationship not available for actual rubber testing indicates a particular field of use for the method.

Additional Experimental GR-S Polymers and Latices

THE table below gives the additions and changes in the list of experimental GR-S polymers and latices authorized by the Office of Rubber Reserve, RFC, during the period from May 25 to June 26, 1951.

Normally, experimental polymers will be produced only at the request of the consumers, and 20 bales (one bale weighs approximately 75 pounds) of the original run will be set aside, if possible, for distribution to other interested companies for their evaluation. The 20 bales, when available, will be distributed in quantities of one bale or two bales upon request to the Sales Division of Rubber Reserve, or will be held for six months after the experimental polymer was produced, unless otherwise consigned before that time. Subsequent production runs will be made if sufficient requests are received.

These new polymers are experimental only, and ORR does not make any representations or warranties of any kind, expressed or implied, as to the specifications or properties of such experimental polymers or the results to be obtained from their use.

X-Number Designation	Polymer Description
	Changes in Previously Announced Polymers
X-636 GR-S	Shortstopped with sodium or potassium dimethyl dithiocarbamate alone, or plus sulfur as sodium polysulfide.
	New Polymers and Latices
X-645 GR-S	Same as GR-S-18, except shortstopped with sodium or potassium dimethyl dithiocarbamate or dimethyl ammonium dimethyl dithiocarbamate, and stabilized with 1.25% ELGI.
X-646 GR-S	A masterbatch of 100 parts of high Mooney GR-S--X-630 polymerized at 117° F., and 25 parts of processing oil Circosol 2XH. Mooney viscosity of the masterbatch, 45. Stabilized with 1.35% PBNA on the rubber.
X-647 GR-S	GR-S-101 shortstopped with sodium or potassium dimethyl dithiocarbamate alone, or plus sulfur as sodium polysulffide.
X-648 GR-S	Same as GR-S-X-598 (X-607, -608, and -609), except polymerized at 54-57° F., bound styrene content of unpigmented polymer is 20±1%.
X-649 GR-S	Same as X-637 GR-S, except butadiene/styrene charge ratio adjusted to give 16.5±1% bound styrene.
X-650 GR-S	Same as GR-S-10, except butadiene/styrene charge ratio adjusted to give 20±1% bound styrene.

Rubber Division Librarian

THE Division of Rubber Chemistry of the American Chemical Society has appointed Miss Betty Jo Clinebell as librarian of the Rubber Library at the University of Akron. The appointment was announced by B. S. Garvey, Jr., Sharples Chemicals, Inc., chairman of the Division's library committee, who stated that this newly created position of librarian was made possible through the cooperation of The Rubber Manufacturers Association, Inc., various suppliers to the rubber industry, and the Division.

The librarian is maintaining a bibliography of current rubber literature following the classification scheme as outlined in the Division publication, "Bibliography of Rubber Literature for 1942 and 1943." Subjects of general interest to the rubber industry will be reviewed periodically, and bibliographies or papers will be prepared for publication. Requests for answers to specific questions in the fields of rubber and plastics will be handled if the information is available in the literature.

Miss Clinebell will publish a revised union list of serials in September, 1951, and will reissue the union list of books by December, 1951. These union lists, which have been made possible through the cooperation of The Firestone Tire & Rubber Co., The General Tire & Rubber Co., The B. F. Goodrich Co., Goodyear Tire & Rubber Co., United States Rubber Co., and the University of Akron, itemize all journals available through the Rubber Library. The initial union lists were issued in January, 1948. Wherever possible, gaps in these lists are being filled by the purchase of suitable items by the Division. In this way the Library has made available one of the world's most complete collections of literature on rubber chem-

istry and technology.

The journals and books included in these lists may be obtained through inter-library loan. An individual wishing to obtain a book or journal should request it from his local library, which will borrow it from the Rubber Library. If the item is not available in the Rubber Library, Miss Clinebell will, in turn, borrow it from one of the cooperating libraries. All requests for inter-library loans, copies of union lists, or answers to questions should be addressed to Miss Clinebell, Rubber Library, University of Akron, Akron, O.

Prior to her appointment, Miss Clinebell was head of the science and technology division of the University of Akron library. She was student assistant in this library for two years previous to her graduation. In 1949 she received a bachelor of science degree from the University of Akron.

Betty Jo Clinebell

ment, E. Braley, New Bedford Rubber Co., Mr. McClean, and P. Thompson, United States Rubber Co.; nearest to pin, C. R. Haynes, Binney & Smith, C. E. Bergamini, Woonsocket Falls Mill Co., and Seth Shorey, Monsanto Chemical Co; most 6's, S. Szulik, Acushnet Process Co.; most 7's, Mr. Mazza, U. S. Rubber; most 8's, Jim Stott, Firestone Tire & Rubber Co.; longest drive, Mr. Newman; high gross, M. Kleeman, Carbide & Carbon Chemical Corp.; high net, R. Willis, Dow Corning Corp.; and putting contest, Mr. O'Grady, Respro, C. Damicone, Acushnet, and L. Yates, Atlantic Paper & Twine Co. Special guest prizes for low gross went to D. Scott, Collyer Insulated Wire Co., Inc.; S. Paulais, Bay State Oil Products Co.; and T. Joy, Gulf Oil Corp. Novelty prizes were given to the best low gross score of each foursome, and door prizes were distributed to all attending the outing.

Current Cold Rubber Synthetic GR-S Latices

DEVELOPMENT of cold rubber synthetic GR-S latices, which has resulted from the work of chemists at the Naugatuck, Conn., synthetic rubber plant operated by Naugatuck Chemical Division, United States Rubber Co. for the Reconstruction Finance Corp., was announced recently by the rubber company. These latices are the result of more than five years of research and two years of experimental pilot-plant production and product evaluation, it was said.

Seven varieties of cold rubber GR-S latex have been developed, and others will undoubtedly be possible.

Demand for cold rubber GR-S latex is exceptionally high throughout the rubber industry although production is still limited, according to John P. Coe, vice president and general manager of Naugatuck Chemical. The current cold rubber expansion program inaugurated by RFC in government owned plants will make increasing quantities of cold rubber latex available to the industry, it was added.

Some details on four of the abovementioned seven varieties of cold GR-S latices are given in the table which appears below.

The latices must first be properly compounded with antioxidant, or poor aging will be encountered. Properly compounded, these latices may be applied by brushing, dipping, spreading, spraying, or pick-up roll methods.

The latices may gel when exposed to temperatures approaching 11° C. (52° F.) and below. This gel, however, is reversible, and exposure to room temperature restores the fluidity of the compound

CURRENT COLD RUBBER GR-S LATICES

GR-S Code	X-547	X-617	X-633	X-635
Styrene, %	30	30	50	30
Butadiene, %	70	70	50	70
Reaction temperature, °F.	50	41	50	50
% Total solids	48.5-49.5	24-25	47.5-49	60-63
Viscosity, 25° C. (77° F.), cps.	low	low	15	50
Yield point, 25° C. (77° F.), cg./cm.^{2}	low	low	6	15
pH	9-11.5	10-11	9.5-11	9.5-11
Mechanical stability	good	good	good	good
Storage stability	good	good	good	good
Particle size, microns	0.2	0.06	0.2	0.2
Res. sty., max. %, on total latex	0.05	0.05	0.05	0.05
Soap content on polymer, %	4.5	7.8	3.75	3.75
Soap type	mixed resin and fatty acid	fatty acid	fatty acid	fatty acid
Styrene in polymer, %	24	23.5	44.5	26.0
Mooney viscosity of polymer	75-100	150	70-100	70-100
Tensile strength at best cure, p.s.i.	2000	....	....	....
Recommended uses	paper saturating, coating, impregnating, tire cord, general purpose	Tire cord, sponge, coating	tire cord, coating	tire cord, sponge, coating

Rhode Island Club Outing

A RECORD attendance of 170 members and guests featured the June 21 annual outing and golf tournament of the Rhode Island Rubber Club at the Metacomet Golf Club, East Providence. The program included an informal luncheon, an afternoon of golf, and an evening dinner, followed by the distribution of golf and door prizes.

Prize winners in the golf tournament included: low gross, A. Kroepel, C. K. Williams & Co., F. Newman, Respro, Inc., and F. F. Salamon, Binney & Smith Co.; low net, Peter Gimber, William Demers, Crescent Co., and F. Burger, Kleistone Rubber Co., Inc.; kicker's tourna-

SORG Has Good Day

The annual summer outing of the Southern Ohio Rubber Group was held June 23 at McCrabb's Grove, Dayton, O. The program included a morning golf tournament at Madden Park Golf Course; a luncheon; an afternoon of softball, horseshoes, croquet, cards, and indoor activities; and a chicken dinner in the evening, followed by the distribution of 48 door prizes.

The blind bogey golf tournament was won by Group Chairman L. J. Keyes, Dayton Rubber Co. Some 28 prizes were awarded in the tournament, with runner-up position shared by J. E. Feldman, Inland Mfg. Division, General Motors Corp., R. K. Ritzert, Dayton Rubber, and R. S. Naegele, Dow Corning Corp. Frank Newton, Dayton Rubber, was chairman of the arrangements committee, which included W. L. Nolan and R. E. Antheil, both of Inland; Louis Wolk and D. A. Meyer, both of Dayton Rubber; and C. L. Zimmerman, C. L. Zimmerman Co.

Detroit Outing Well Attended

The Detroit Rubber & Plastics Group, Inc., held its annual summer outing on June 22 at the Forest Lake Golf & Country Club, Pontiac, Mich. Some 310 members and guests were present, and approximately 175 participated in the afternoon golf tournament, won by Gerald Walker, Permalastic Products, Inc. W. Thimm, Ford Motor Co., won the prize for the longest drive; Al Furkman, Minnesota Mining & Mfg. Co., took the "closest to cup" prize; and 10 men shared honors in the kickers' handicap.

The tournament was followed by a cocktail hour and dinner, and the outing concluded with a drawing for some 200 door prizes. Credit for the success of the outing is due the committee in charge of arrangements, composed of Howard Neale, Pioneer Latex & Chemical Co.; John Craft, General Tire & Rubber Co.; John Lidden, E. I. du Pont de Nemours & Co., Inc.; Walter Bauer, Brown Rubber Co.; and Tom Halloran, Chemical Products, Inc.

COMING: "Machinery and Equipment for Rubber and Plastics—Volume I—Primary Machinery and Equipment."

NEWS of the MONTH

NPA Again Amends M-2 Order Revoking Spare Tire Ban and Setting Civilian Consumption at 100,000 Tons a Month; Litchfield Recommends More Synthetic Capacity

The National Production Authority on July 17 again amended Rubber Order M-2, increasing permitted consumption of new rubber to a monthly level of almost 100,000 long tons for civilian goods. The increase, which amounted to about 1,500 tons a month, was due to a broadening of the so-called "small business exemption" to 150,000 pounds of new rubber per calendar quarter. The ban on the fifth tire for new automobiles imposed on April 1, 1951, was also revoked, and various other changes were included in the July 17 amendment.

Relaxation of controls on the rubber industry is now considered possible by the end of the current year, but not before. Another statement on the government's natural rubber buying program is now scheduled for October 1.

The Reconstruction Finance Corp. will give purchasers of synthetic rubber 30 days in which to pay for the material, starting with July shipments. RFC's Industry Advisory Committee continued its meetings during July with Administrator W. Stuart Symington to consider the future of the government's rubber program.

The Office of Price Stabilization froze ceiling prices on rubber products during July, pending Congressional action on a new Defense Production Act. OPS relaxed ceiling price restrictions on strategic and critical materials purchased by the General Services Administration for stockpiling.

P. W. Litchfield, chairman of the board, Goodyear Tire & Rubber Co., urged that facilities for the production of synthetic rubber be greatly expanded in view of the very probable considerable increase in new rubber consumption between now and 1960. He discounted the possibility that any appreciable increase in natural rubber production would be possible during the next decade.

Negotiations between the United Rubber Workers of America, CIO, and The B. F. Goodrich Co. and the Firestone Tire & Rubber Co., on the subject of another round of wage increases began in July.

Washington Report

By

ARTHUR J. KRAFT

NPA Actions

NPA amended M-2 on July 17, increasing permitted consumption of new rubber to a monthly level of almost 100,000 long tons for civilian goods. The agency said this level, an increase of some 1,500 tons a month, is high enough "to assure an adequate supply of virtually all types of rubber products."

The increase will result from one of many changes made in the July 17 amendment, the broadening of the so-called "small business exemption." The order now exempts companies consuming up to 150,000 pounds of new rubber per calendar quarter from limitations on total civilian usage, regardless of whether the 679 users consumed that much during the base period.

The previous exemption applied only to companies using no more than 25,000 pounds a month—75,000 pounds a quarter—the 384 smallest rubber users. The increase in the exemption to 150,000 pounds a quarter added 295 additional consumers to the list.

Other changes made in the July revision of M-2, which became effective July 17, were:

(1) The ban on the fifth tire for new automobiles was revoked. Imposed on April 1, this provision prohibited tire companies from delivering more than four new tires for each new vehicle turned out by the passenger-car manufacturer and prohibited the car maker from delivering an auto equipped with more than four tires.

(2) A new system to conform with the Controlled Materials Plan was provided for governing extra allotments of rubber for use in filling government-rated priority orders. Extra allotments will be provided only to fill orders which are part of specified defense programs as listed in a new Appendix C to M-2.

The effect of the new system on the amount of extra rubber will not be very great, an official said. Under the system in effect heretofore, a manufacturer could apply for an extra allotment to compensate him for the rubber he used from his normal civilian allocation to fill any "DO" rated priority order except DO-87 and DO-97 orders.

(3) Allocations of new rubber for civilian use are now on a quarterly basis. This ruling applies to both dry and latex forms of synthetic and natural rubbers. The base quarterly consumption is defined as one-fourth of the manufacturer's actual use in the year ended June 30, 1950, as adjusted by NPA.

A manufacturer will be permitted to use up to 40% of his quarterly allocation in any one month. Manufacturers, however, cannot purchase more than one-third of their quarterly synthetic rubber allotments in any one month. To use 40% in one month, the manufacturer must draw on his own inventory.

(4) Companies covered by the small business exemption cannot use more natural rubber than they used in the past. The order limits their quarterly purchases and use to 64% of one-fourth of their base-period use of dry natural rubber, the current average for the entire industry.

Increased usage by the companies covered by the exemption will result from instructions issued by NPA to RFC that each rubber consumer's allocation of GR-S be raised 25% so long as this increase does not put a company's quarterly allotment over 150,000 pounds.

The order prohibits companies covered by the small user exemption from increasing their quarterly consumption above 90% of their base-period rate in producing the "non-essential" items listed in Appendix B. It also prohibits such companies from reselling rubber compounds to other rubber goods manufacturers.

(5) In applying for allotments of extra rubber for defense orders, the consumer must specify how much he wants as regular GR-S and how much as cold GR-S.

(6) Manufacturers must continue to channel at least as much rubber into truck tires in the third quarter as they did in the second quarter. While the critical truck tire shortage of the past spring has been eliminated by stepped-up second-quarter output, NPA does not want production of truck tires to decline.

(7) West African grades of wild rubber can be imported privately and used without regard to other limitations.

(8) Reports of consumption of rubber in laboratory experimental programs need be filed annually instead of monthly.

(9) NPAF-5, a report on monthly output, shipment, and stocks of tires, tubes, airbags, flaps, etc., is to be filed on the twentieth day of the month following the month in which production was made instead of the tenth day.

(10) Some dozen minor changes were made in Appendix A, the list of specifications limiting the natural rubber content of rubber products.

(11) While household and appliance products output is still limited to 90% of base-period output, functional parts of these items made for replacement purposes are now exempt from this limit.

(12) The ban on using DO-97 orders for transportation products continues to apply to the DO-MRO rating which has replaced the DO-97 designation under the CMP program.

NPA said that lifting the ban on the fifth tire for new passenger cars will neither increase nor decrease the requirement for original equipment tires. Passenger-car manufacturers used six million tires for 1.5 million cars they turned out in the second quarter when the ban was in effect. With five tires to a car, they will use six million tires on 1.2 million cars which are expected to be produced in the third quarter. Automobile output is being held to that figure in the current quarter by limitations imposed by NPA on the industry's use of steel.

The rubber goods manufacturer can qualify for an allotment of extra rubber to make a component for a piece of equipment being made under an Appendix C defense program by another company. These programs are those of the Defense Department, the Coast Guard, the Army, the Atomic Energy Commis-

sion, and the State Department's "Voice of America" program.

If the component made by the rubber manufacturer is an "A" product under CMP regulations, he can go directly to the agency operating the program for an "A" rating. NPA's rubber division will honor that rating with an extra allotment of rubber.

If, on the other hand, the component made by the rubber manufacturer will be supplied to the manufacturer of a "B" product to be used in the piece of equipment ordered by the agency, the rubber goods manufacturer cannot get a rating, either "A" or "B." What he can do is obtain in writing the contract number assigned to the equipment manufacturer by the agency involved. He can get this number from the company making the "B" part. The rubber manufacturer notifies NPA's rubber division of this contract number in order to qualify for an extra allotment.

Manufacturers of rubber products for the civilian market were directed by the NPA on July 1 to restrict their use of high-tenacity rayon to their average quarterly rate of consumption in the first half of 1951.

The restriction was imposed through an amendment to M-2, announced June 27, to take effect July 1. It was ordered to forestall further tightening of the high-tenacity rayon supply. Under the CMP, rubber manufacturers are permitted to apply priority ratings to orders for components.

NPA explained that it feared that since manufacturers prefer high-tenacity rayon to cotton, they might use the priority rating to buy rayon only, thus "creating a demand greater than the supply."

Officials said the restriction on rayon use will not mean fewer tires, belting or hose because cotton can be used as an alternate material in these products, except where military specifications require rayon.

Relaxation of Controls

Controls on the rubber industry will be relaxed "substantially" about the end of the current year, but not before, according to the government's planners in this field. The controls in question are NPA's restrictions on consumption of rubber and the GSA's exclusive buying of natural rubber for industry.

Government men believe they will be able to slow down the rate of stockpile buying about December or January, provided stockpile accumulation continues to improve at its present pace. Based on this expectation of continual improvement, current plans are to restore to industry the right to buy its own natural rubber at about the end of the year.

At about the same time restrictions on consumption of rubber in civilian goods may also be eased, particularly the flat limitations on new rubber usage which will hold civilian consumption to about 100,000 long tons a month through the current quarter.

The more certain step—an end to the exclusive buying program—will be preceded, it is now planned, by an official statement to be made about October 1, promising an end to the program. It may by somewhat more specific than the May 18 statement of GSA Administrator Jess Larson promising an end to exclusive buying "in the foreseeable future."

Whether and how much additional rubber could be made available for civilian goods when the government scales down the rate of stockpile buying will depend on the demands for military goods. The limited information available publicly indicates that military demands for rubber goods will continue to increase through the coming year. On the other hand, the impact of rising military demands on the available rubber supply may be softened by the fact that the military already has started stocking up on tires. In contrast to many other industries which are just beginning to convert to military production, the tire makers for several months have been filling military orders for tires to be used in the fairly distant future. Several tire companies, it is said, have implored the Defense Department to take immediate delivery on tires made under defense contracts to relieve the companies' warehouses.

CALENDAR

Aug. 17.	**Chicago Section, SPE; Midwest Chapter, SPI. Golf Outing. River Forest Golf Club, Elmhurst, Ill.**
Aug. 24.	**Philadelphia Rubber Group, Annual Outing, Cedarbrook Country Club, Philadelphia, Pa.**
Sept. 2-8.	**American Chemical Society, New York, N. Y.**
Sept. 5-7.	**Division of Rubber Chemistry, A. C. S. Hotel Commodore, New York, N. Y.**
Sept. 9-11.	**International Congress of Pure & Applied Chemistry. New York, N. Y.**
Sept. 20.	**Southern Ohio Rubber Group, Engineer's Club, Dayton, O.**
Sept. 28.	**Symposium, "Modern Rubber Testing." Institution of the Rubber Industry. London, England.**
Oct. 1-5.	**International Standards Organization—Technical Committee 45 on Rubber. Oxford, England.**
Oct. 2.	**The Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.**
Oct. 5.	**Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.**
Oct. 8-12.	**National Hardware Show, Grand Central Palace, New York, N. Y.** **Thirty-Ninth National Safety Congress and Exposition, Chicago, Ill.**
Oct. 10.	**Newark Section, SPE. Military Park Hotel, Newark, N. J.** **Chicago Section, SPE; Midwest Chapter, SPI. Builder's Club, Chicago, Ill.**
Oct. 17.	**New York Section, SPE. Hotel Gotham, New York, N. Y.**
Oct. 19.	**Akron Rubber Group.** **Boston Rubber Group.**
Oct. 22-24.	**Packaging Institute Annual Forum. Hotel Commodore, New York, N. Y.**
Oct. 23.	**Buffalo Rubber Group, Hotel Westbrook, Buffalo, N. Y.** **Association of Consulting Chemists & Chemical Engineers. Annual Meeting. Hotel Shelburne, New York, N. Y.**
Oct. 26.	**New York Rubber Group. Henry Hudson Hotel, New York, N. Y.**
Nov. 2.	**Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.**
Nov. 14.	**Chicago Section, SPE; Midwest Chapter, SPI. Builder's Club, Chicago, Ill.** **Newark Section, SPE. Military Park Hotel, Newark, N. J.**
Nov. 14-15.	**International Symposium on Abrasion and Wear. Rubber Stichting, Delft, Netherlands.**
Nov. 21.	**New York Section, SPE. Hotel Gotham, New York, N. Y.**
Nov. 25-Dec. 1.	**International Congress of Industrial Chemistry. Paris, France.**
Nov. 26-Dec. 1.	**Chemical Industries Exposition. Grand Central Palace, New York, N. Y.**

RFC Activities

RFC Administrator Symington announced June 26 that starting with July shipments that agency will give purchasers of synthetic rubber 30 days in which to pay for the material after orders are booked.

The switch from RFC's former cash-on-the-line was requested by the agency's Rubber Industry Advisory committee at its initial meeting with Symington on June 18. The industry group pointed out that payment at the time the order was booked strained the financial resources of some small companies, particularly since many had run into delays in getting delivery of the rubber ordered from RFC.

Completion of a barter deal with Western Germany under which RFC will receive 25,000 tons of benzol for producing styrene in the synthetic rubber plants was announced July 13. In exchange, RFC will ship some 75,000 tons of 90 octane premium gasoline to Benzol Verband, a sales organization whose members account for 70% of West Germany's production of benzol. Benzol Verband operates some 6,000 gasoline filling stations in Germany.

RFC said German benzol will begin arriving at American ports in the "immediate future." The negotiations, in progress several months, were initiated on a visit to Germany by Rubber Reserve Director Gerald B. Hadlock and originally involved an exchange for only 7,500 tons of benzol.

Negotiations were concluded, and agreement was reached in Washington between RFC and three officers of the German organization.

Symington and his nine-man Rubber Industry Advisory Committee continued their semi-monthly meetings in July, conferring in Washington on July 3 and again on July 17.

The industry leaders presented their ideas on the future relation of synthetic and natural rubber. There was "no substantial disagreement" on the position taken by Litchfield of Goodyear that the nation must prepare for a heavier demand for rubber in the coming decade by expanding its production of synthetic.

There were differencs, however, on the size of the ultimate market for synthetics. The differences expressed by some members of the committee were characterized as "a matter of degree."

Members of the committee also reviewed future demand for cold rubber, with some favoring a complete conversion of remaining regular GR-S production to cold rubber. RFC pointed out that since there is still some demand for regular GR-S, it is unlikely that the government would convert to more than 75% cold rubber as against 25% regular GR-S.

Purpose of the discussions was to help RFC set its sights for the future. The agency plans to bring its cold rubber output up to about 50% of total GR-S production in the 100,000-ton expansion program now being launched.

Demand for rubber-oil masterbatches was also reviewed. RFC sold 5.6 million pounds of these masterbatches in June and 6.6 pounds in July, it was reported, and assured the industry men that it stands ready to step up its output as rapidly as industry asks for more of this-type synthetic rubber.

Price Controls

Government ordered reductions in the price of rubber products to reflect lower costs of natural rubber entered into the Congressional debate on extension of the Defense Production Act beyond July 31.

Rep. Wright D. Patman (D., Tex.), chairman of the House Small Business Committee, warned his colleagues in floor debate that the broad "anti-rollback" amendment proposed by Rep. E. E. Cox (D., Ga.) would forestall any effort by OPS to reduce the ceiling prices of tires and other rubber products.

An "anti-rollback" amendment for industrial as well as agricultural commodities was approved by the Senate in late June as one feature of a measure intended to extend defense controls for eight months beyond June 30. The measure was put aside when both houses agreed to a temporary one-month extension which also barred rollbacks.

The Cox amendment, almost identical to the provision of the Senate bill, was assailed by Patman in floor debate July 17 and rejected, subject to another vote, by a substantial margin. Patman used the drop in price of natural rubber as a peg for his argument against the "anti-rollback" amendment, when he said:

"Now, take rubber for instance. Rubber has gone down from 85¢ a pound to 45¢ a pound. Do you mean to say that these manufacturing concerns making automobile tires and everything else with rubber should be allowed to sell on the basis of 85¢ rubber when they are only paying 45¢ a pound for it? Why, certainly they should not. Well, who is going to correct it? The Price Administration, unless this amendment passes, and then nobody can correct it."

On June 30, after Congress prohibited rollbacks on all products during July, OPS issued General Overriding Regulation 13, freezing manufacturers to the price ceilings in effect on June 30. Price Stabilizer M. DiSalle interpreted the Congressional action as a directive to "maintain the status quo"—that is, to neither increase nor decrease price ceilings.

The regulation was preceded by two orders issued June 29 to take effect July 2. One of these was Supplementary Regulation 10 to Ceiling Price Regulation 22 (the general manufacturers order), requiring manufacturers of tires and tubes to hold to their existing ceilings under the General Ceiling Price Regulation instead of taking the ceiling price advances to which they would have been entitled on July 2 under the terms of CPR 22. This amendment also permitted manufacturers of some molded, extruded, and cut mechanical rubber goods to price under either GCPR or CPR 22 those items whose sales during the second quarter of this year amounted to less than $10,000. The option to take CPR 22 ceilings was subsequently denied by GOR 13.

The other order was SR-8 to CPR 22, also effective July 2, which directed each manufacturer of a wide range of rubber products, including druggists' sundries, rubber footwear, bathing caps, rubber bands and erasers, to compute his price ceiling by multiplying his base-period price by one of the several industry factors set out in this amendment. OPS said it intended to add several other products, including rubber thread, hose, belting, sponge and foam rubber products, tapes, and tiling to this amendment within a few days. SR-8 never went into effect during July, however, because of the status quo policy set forth June 30 by GOR 13.

Under CPR 22 formula, tire and tube manufacturers had increases coming to them July 2 averaging 4.18% on replacement tires and tubes and 5.95% on original equipment tires and tubes. They were forestalled from taking these increases by SR-10 to CPR 22.

OPS denied the increases on June 29 (before it knew what disposition of the Defense Act extension Congress would make later that day), pending determination of the impact of GSA's reduction in the selling price of natural rubber on tire and tube manufacturing costs. The June 29 order was intended only to "postpone" any changes in tire and tube price ceilings until the cost factors could be recalculated, taking into account the 14¢ a pound cut in natural rubber prices as well as the post-Korea advances in other materials and labor.

Patman's argument that an "anti-rollback" provision would frustrate any efforts by OPS to lower ceilings on rubber products to reflect lower ceiling prices of natural rubber would appear to hold in the eventuality that natural rubber prices are cut deeper than the 52¢ a pound level established on July 1. It appears doubtful, however, that an "anti-rollback" amendment in a long-term extension of defense controls would nullify the action taken by OPS on June 29 since SR-10 required tire and tube manufacturers to hold to their existing ceilings for an indefinite period.

OPS authorized coated fabrics manufacturers pricing under CPR 22 to exclude the cost of fabrics in computing their labor cost ratios and to segregate the costs of fabrics and coatings in calculating the post-Korea increases in their materials costs.

The action, Supplementary Regulation 11 to CPR 22, took effect July 23 for the manufacturers who started pricing under CPR 22 before July 1 and is intended to cover others if the new controls extension law permits.

OPS expects that the new alternate computation methods provided by SR 11 will be of some help to manufacturers whose major output in the coated materials field is in unsupported sheetings of rubber or plastic. It will put them on a comparable basis in calculating cost adjustment factors—the purpose of which is to determine ceiling prices—with competitors who devote more of their output to coating textiles, their own or someone else's.

SR 11 also permits coated fabric manufacturers to add their customary base-period differentials for colors, widths, weights, special effects and surfaces and to file new ceilings including the differentials and extras. Manufacturers can use the "offering price" of a textile ordered from their usual source of supply in calculating materials costs as of June and December 31, 1950.

Price Exemption—Stockpile Materials

The OPS relaxed ceiling price restrictions on strategic and critical materials purchased by the GSA for stockpiling by Amendment 1 to GOR 2, on July 3. The amendment specifically exempts sales of strategic and critical materials to GSA when procured from foreign sources. Domestic sales are exempt if GSA certifies to OPS that the materials are from marginal domestic sources or from specially constructed facilities.

So far as its impact on GSA's operation as buyer of natural rubber for the stockpile is concerned, the amendment frees GSA of the necessity of applying to OPS for an exemption or approval for each transaction made at above existing ceilings.

United States Rubber Industry Employment, Wages, Hours

	Prod. Workers 1000's	Ave. Week. Earnings	Ave. Week. Hours	Ave. Hour. Earnings	Consumers Price Index
All Rubber Products					
1939	121	$27.84	39.9	$0.745	99.4
1948	209	56.78	39.0	1.456	171.2
1949	186	57.79	38.3	1.509	169.1
1950					
Jan.	187	60.52	39.4	1.536	168.2
Feb.	188	59.90	39.2	1.528	167.9
Mar.	189	59.70	39.3	1.519	168.4
Apr.	191	61.76	40.0	1.544	168.5
May	194	64.52	41.2	1.566	169.3
June	199	65.08	41.4	1.572	170.2
July	200	65.59	41.2	1.592	172.0
Aug.	208	66.25	41.8	1.585	173.4
Sept.	215	66.58	41.9	1.589	174.6
Oct.	219	66.29	41.9	1.582	175.6
Nov.	222	66.68	41.6	1.603	176.4
Dec.	222	69.18	41.8	1.655	178.8
Tires and Tubes					
1939	54.2	$33.36	35.0	$0.957	
1948	96.2	62.16	37.2	1.671	
1949	83.6	63.26	36.4	1.738	
1950					
Jan.	82.6	67.70	38.4	1.763	
Feb.	83.1	67.22	38.3	1.755	
Mar.	83.4	65.26	37.4	1.745	
Apr.	84.0	69.23	39.0	1.775	
May	85.9	74.60	41.1	1.815	
June	88.0	74.05	40.6	1.824	
July	88.3	75.22	40.4	1.862	
Aug.	89.6	76.01	40.8	1.863	
Sept.	91.7	75.46	40.9	1.845	
Oct.	92.0	73.12	40.2	1.819	
Nov.	93.5	73.86	40.1	1.842	
Dec.	93.1	76.83	40.1	1.916	
Rubber Footwear					
1939	14.8	$22.80	37.5	$0.607	
1948	24.6	51.75	41.8	1.238	
1949	21.6	48.94	38.6	1.268	
1950					
Jan.	20.1	45.87	35.7	1.285	
Feb.	18.8	43.06	34.2	1.259	
Mar.	19.4	51.04	40.0	1.276	
Apr.	19.3	50.36	39.5	1.275	
May	19.1	50.20	39.4	1.274	
June	19.3	52.07	40.3	1.292	
July	19.2	52.13	39.7	1.313	
Aug.	20.7	53.93	41.9	1.287	
Sept.	21.8	53.95	41.5	1.300	
Oct.	22.8	56.00	42.2	1.327	
Nov.	23.3	54.52	42.1	1.295	
Dec.	23.9	59.17	42.6	1.389	
Other Rubber Products					
1939	51.9	$23.34	38.9	$0.605	
1948	88.1	52.47	40.3	1.302	
1949	80.9	54.38	40.1	1.356	
1950					
Jan.	84.5	57.04	41.3	1.381	
Feb.	86.3	56.43	41.1	1.373	
Mar.	86.2	56.16	40.9	1.373	
Apr.	87.2	57.13	41.1	1.390	
May	88.8	57.92	41.7	1.389	
June	92.0	59.23	42.4	1.397	
July	92.8	59.08	42.2	1.400	
Aug.	98.0	60.13	42.8	1.405	
Sept.	101.0	61.30	42.9	1.429	
Oct.	104.1	62.48	43.3	1.443	
Nov.	104.7	63.11	42.9	1.471	
Dec.	105.3	64.80	43.2	1.500	

SOURCE: BLS, United States Department of Labor, Washington, D. C.

"This procedure," OPS said, "is unduly cumbersome and imposes restrictions which may seriously interfere with the objectives of the stockpiling program." It noted that GSA when buying overseas "must in many instances, pay the current world market price, which frequently is higher than the ceiling price."

The exemption was authorized on the advice of the Munitions Board that it was necessary to the stockpiling program. GSA had pointed out to the Board, for which it does the stockpile buying, that the need for prior OPS clearance of an above-ceiling transaction had frustrated possible advantageous, quick deals for substantial quantities of foreign materials.

Other Industry News

Litchfield Urges More Synthetic Facilities

Litchfield, of Goodyear, in another of his "Notes on America's Rubber Industry", entitled "Looking Ahead to 1960," issued in early July, warned that while the supply-demand situation on rubber is returning to normalcy, the same skyrocketing prices of natural rubber we experienced in 1950 and early 1951 can return again in the future unless the nation greatly expands its synthetic rubber producing facilities.

Litchfield claimed that because the government owned synthetic rubber plants was not properly and understandingly managed in 1950, consumers of tires and other rubber goods in America lost 500 million dollars in that year.

Referring to the immediate postwar years, he stated that the restraining influence of synthetic reserves and output held natural rubber to an average price of about 20¢ a pound, despite short supply and increasing demand. By the close of 1949, however, synthetic plants were being gradually closed down, and synthetic reserves were being depleted with a production low of 19,000 tons of GR-S type for the month of January, 1950.

"It should be noted here that the government had permitted this deterioration of the synthetic situation in the face of warnings and recommendations of the rubber industry," Litchfield recalled. "It was recommended, for instance, that a minimum synthetic stockpile of 100,000 tons be maintained along with finished inventories of sufficient size to meet suddenly expanding demands.

"Some of the sources of essential raw materials needed in the production of synthetic were permitted to dry up. The closing of the synthetic plants themselves was in some instances handled in such manner as to protract and delay their subsequent reactivation."

Accelerated automobile production, consumption of gasoline, and demand for rubber products of all kinds sent civilian America into the market for an unprecedented 1,259,000 long tons of new rubber in 1950, and the situation was intensified as the government started stockpiling to meet the demands of the military situation in Korea and threats of national security, it was said.

With the diminshed output of synthetic "the brakes were off on natural rubber prices," Litchfield emphasized.

Looking ahead to 1960, Litchfield predicts that the world demand for rubber will far exceed the present maximum production of 3,500,000 long tons from synthetic and natural sources.

"If the rate of increase in the consumption of new rubber continues in the present decade as it has established itself in the decades since 1900, our need for new rubber in 1960 will materially exceed this available supply," he warned.

"There is good reason to believe that the world markets in 1960 could consume as much as 4,000,000 long tons. Outside of this country, the current rate of consumption is one pound per person per year — exactly what the United States per capita consumption was 50 years ago. More automobiles, more gasoline consumption, more new uses for rubber in America will keep our domestic demand on the upgrade. Higher standards of living outside this country will materially increase foreign consumption of rubber," Litchfield added.

No appreciable expansion of our potential supply of natural rubber can be hoped for since practically no planting of new rubber trees has occurred over the past 10 years.

"Thus we are left only one way out," Litchfield concluded. "Facilities for the production of synthetic rubber must be greatly expanded."

Natural Rubber News for July made the following comment on the Litchfield suggestion:

"Mr. Litchfield's sole solution to the problem, however, is increased synthetic production. While we agree that synthetic production will share in the increased demand, we also strongly feel that the answer to a major portion of the forecasted shortage lies in new plantings of *Hevea* trees and an intensive replanting of old trees by proven high-yielding replacements. The average yield of the present area in production is somewhere in the neighborhood of 500 pounds per acre per year. Proven high-yielding stock is presently netting 2,000 pounds per acre and over per annum. The natural rubber producing industry has a challenge to meet, and we believe it can be depended upon to fully meet its share of the increased demand."

Carbon Black Statistics — First Quarter, 1951

Following are statistics for production, shipments, producers' stocks, and exports of carbon black for the first quarter, 1951. Furnace blacks are classified as follows: SRF, semi-reinforcing furnace black; HMF, high modulus furnace black; FEF, fast extruding furnace black; and HAF, high abrasion furnace black. Statistics on thermal black are included with SRF black to avoid disclosure of individual company operations.

(Thousands of Pounds)

	Jan.	Feb.	Mar.
Production:			
Furnace types:			
SRF	28,057	27,253	26,695
HMF	11,603	10,028	13,004
FEF	14,784	13,447	16,583
HAF	20,368	19,721	21,432
Total	74,812	70,449	80,714
Contact types	54,442	49,646	55,716
TOTALS	129,254	120,095	136,430
Shipments:			
Furnace types:			
SRF	30,114	27,714	28,786
HMF	9,984	9,465	12,826
FEF	15,311	13,532	16,434
HAF	21,916	17,506	20,352
Total	77,325	68,217	78,398
Contact types	46,296	51,512	58,895
TOTALS	123,621	119,729	137,293
Producers' Stocks, End of Period:			
Furnace types:			
SRF	4,058	3,597	4,506
HMF	7,782	8,345	8,523
FEF	2,170	2,085	2,234
HAF	5,328	7,543	8,623
Total	19,338	21,570	23,886
Contact types	73,460	71,594	68,415
TOTALS	92,798	93,164	92,301
Exports:			
Furnace types	13,309	13,309	12,655
Contact types	20,310	20,310	26,536
TOTALS	33,619	33,619	39,191

SOURCE: Bureau of Mines, United States Department of the Interior, Washington 25, D. C.

Synthetic Rubber Developments

The July issue of *Natural Rubber News* also carries an article on "Synthetic Rubber" by John T. Cox, Jr., consulting chemical engineer of Washington, D. C.

GR-S production is steadily climbing and by the year's end should reach a rate of 72,000 tons a month, it was said.

Butyl production has been somewhat hampered by equipment troubles, and the estimates made previously on output are not likely of realization. Much discussion continues about additional butyl production facilities, but no announcement of commitment has been made.

The present synthetic rubber production expansion program of the RFC which does not involve any new plants was also discussed by Dr. Cox. In this connection, the new cold rubber capacity of the GR-S plants should approach 415,000 tons a year, or about 49% of the program, it is said.

In commenting on the oil-rubber masterbatches, of which there has been a complete revelation of the processes used by The General Tire & Rubber Co. and the Goodyear Company, the latter in the RFC plants, Cox stated that the mixtures so obtained appear to offer a *substantial method of stretching the rubber hydrocarbon supply with no loss in properties insofar as tire performance is concerned.* (Italics are the author's. EDITOR.)

Tire test results are presented comparing the Goodyear-RFC process and the General Tire process with GR-S cold rubber-black masterbatch. Using the latter as a control and the tire test results for such rubber being set at 100%, the Goodyear-RFC rubber gave a rating of 107% and the General Tire rubber gave a rating of 123.5%.

"Should these tests be sustained over a longer period of examination, it is apparent that General has made a contribution to Americn rubber technology of very, very great dimension," Dr. Cox said. "It will widen our knowledge of the polymer field and may give us an even more secure position in our defense stockpile."

Labor News

The difficulty between Goodyear and URWA, mostly at the Akron, O., plants of the company, which was reported last month, continued throughout July.

The major problem was differences between the company and the union over the supplemental agreement for the Akron area locals to the new company-wide contract signed on March 30. Contributory problems were a strike at the government owned synthetic rubber plant operated by Goodyear in Akron over safety measures in that plant and dissatisfaction among some of the workers at Goodyear's Plant C (Pliofilm) in Akron.

URWA local 2 in Akron handed the Goodyear company a five-day notice to cancel its contract on June 21, which could mean a strike of the several thousand workers at the Akron plants. Repeated extensions of the contract were made on a day-to-day basis, while negotiations continued with the supplemental agreement. A meeting of the union scheduled for July 1 to ratify the agreement did not result in a vote on the matter because of a technicality in the local union by-laws which required that the agreement should be read at a regular meeting and then voted on at another special meeting. A final meeting was scheduled for some time during the third week in July.

After much discussion between the Ohio Industrial Relations Department, the Goodyear company, and the safety inspectors of the Office of Rubber Reserve, the synthetic rubber plant in Akron was reopened on July 5 with the understanding that the Ohio Industrial Relations Department would make another safety inspection in about 10 days when the plant was in full production. A previous inspection by ORR had reported that the plant complied fully with federal regulations and disagreed with the Ohio state department's report which said the plant required additional safety equipment. In mid-July, delays in getting the plant in full production due to clogged lines and tanks was reported.

A strike which began April 7 at the plant of the Johnson Rubber Co. in Middlefield, O., was ended June 27. Local No. 399 of the URWA accepted a new one-year contract providing for a 2¢-an-hour wage increase to be added to a previous 1¢ to 17¢ an hour adjustment, a modified union shop, and other benefits. About 700 workers were involved at this plant.

Negotiations between the Goodrich and the Firestone companies and the URWA began during July on the matter of another round of wage increases for employes of these companies. The amount of the wage increase has not been indicated by the union except that it has indicated that it should be "substantial." There was also indication that greater insurance and pension benefits would be demanded.

Local No. 9 of the URWA at the General Tire Akron plant announced July 4 that it had broken off negotiations on a new supplemental agreement. The company and the union signed a master contract in May, and it is necessary to arrive at a supplemental agreement to cover the Akron plant before the master contract can go into effect. The difficulty is said to center about the length of the work week and the fact that the company wanted a provision that layoffs, rehiring, and shortened work weeks be dependent on economic conditions.

General Cable Corp. shut its Rome, N. Y., plant July 17 and announced it was also closing two plants in California until union employes "return to work and work at the regular pace they have maintained in the past." Production workers at the three plants are represented by the United Electrical Workers Union, independent.

The company said various departments in the three plants had been striking from time to time. The company and the union had been negotiating on a wage increase with the union asking a 15¢ an hour increase and the company offering 7½¢ an hour.

EAST

Forms New Department

A new sales department for synthetic yarns and synthetic industrial fabrics has been established by the textile division of United States Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y., according to J. W. Solomon, Jr., general sales manager of the division. This department is handling the distribution of dynel and rayon knitting yarns, dynel filter fabrics, synthetic yarns for the hosiery trade, and additional lines for consumer and industrial goods.

Formation of the new sales department follows several years of development of the newer synthetic fibers by the new products department in New York and at Winnsboro Mills and the textile development laboratory in Winnsboro, S. C.

The department is under the supervision of Charles S. Fowler, merchandise coordinator of the textile division. Sales personnel consists of J. L. Kurlychek, F. T. Hopkins, and J. H. Shaw, all previously affiliated with the textile division.

Smith Retiring; Other Changes

Herbert E. Smith, chairman and chief executive officer of U. S. Rubber, will retire on August 31 after 38 years with the company. He will, however, continue as a director and a member of the finance committee.

Mr. Smith started as a salesman in the San Francisco branch in 1913, rose through sales and managerial channels to a vice presidency in 1929, succeeded to the presidency in 1942, and became chairman and chief executive officer in 1949.

Samuel R. Phillips has been appointed assistant to the general manager of the textile division; while Staton J. Peele, Jr., succeeds him as manager of sales and production coordination for the textile division.

Mr. Phillips joined the rubber company in 1939 at Stark Mills, Hogansville, Ga., and was transferred to the company's general offices in New York in 1941. In 1946 he was appointed assistant manager of sales and production coordination and became manager of this department in 1948. During World War II, Mr. Phillips served two years in the Navy.

Mr. Peele, after five years in the Navy, came to U. S. Rubber in 1946 at Hogansville, but left to accept an appointment as town manager of Belhaven. In 1950 he returned to the rubber company as a member of the textile division's production scheduling department at New York.

Ben Holm, technician in the central laboratories of U. S. Rubber in Passaic, N. J., retired June 28 after 42 years of continuous service. To mark the occasion, he was feted by his fellow employes at a special luncheon. Besides a suitably inscribed gold watch presented him by the company Holm also received a "purse" from his fellow employes. He joined the company in 1909 as a tire builder in Chelsea, Mass.; was later transferred to the Providence plant as a supervisor; in 1915 became a member of the central laboratories staff at New York, and went to Passaic when the laboratories were transfered there in 1928.

His son, David, is currently employed at the laboratories as a photographer and technician.

Plastic Device for Textile Mills

Development of a new plastic yarn-carrying sleeve for use in textile mills on Barber Colman spooling machines has been announced by U. S. Rubber's mechanical goods division. Made from Uscolite, a thermoplastic blend of rubber and plastic, the new sleeve is expected greatly to reduce maintenance costs encountered by mills in replacing wornout sleeves. One mill may have been 30,000-50,000 sleeves in operation, and replacement has run as high as 15% annually. The new Uscolite sleeve, it is claimed, has more than five times the impact strength of phenolic types now in widespread use; will not shatter, chip, or warp; will not nick around the edges; and can be used with cotton, rayon, or the newer synthetic fibers spun on the cotton system. A waffle design on the sleeve surface permits it to carry yarn more securely. Made in three colors, blue, grey, and brown, the new sleeve is available in two sizes to fit the principal types of spoolers.

G-E Appointments

General Electric Co., Schenectady, N. Y., has appointed Louis S. Gleason superintendent at its chemical department's plastics molding plant at Decatur, Ill. Mr. Gleason first started with the company in 1916 as a machinist, later transferring to the tool room. After two years he was assigned to the mold design section and in 1931 was put in charge of the plastics division tool room. Ten years later he was named manager of the Pittsfield, Mass., molding plant. Then in 1945 he was made manufacturing manager, but in 1948 resigned to form his own firm, Gleason Tool Co. For the past year he has been with the Niagara Insul-Bake Specialty Co.

Alfred F. Fields has been made manager of mold manufacture for the plastics division to succeed G. Arthur Gustafson, temporarily assigned to the post in addition to his duties as manufacturing and materials engineer for the division. Mr. Fields started with G-E in 1912 in the first formally organized apprentice course at the Pittsfield apparatus works. He spent the first six years following graduation as a mold maker and in 1922 became a foreman in the tool room for the molded insulation department, the forerunner of the plastics division. In 1930, Mr. Fields went to plastics engineering, where he held several posts before being appointed works engineer for the Pittsfield molded plastics plant, and in 1947 was made assistant plant manager, a position he retained until named manufacturing engineer in 1948.

Irvington Varnish & Insulator Co., Irvington, N. J., last month announced three important promotions. E. A. Freiburger, sales service manager, has been named general sales manager of the coating division, in charge of all sales activities for the coating division, including market research and sales promotion with the exception of cable insulation sales. Jean H. Rooney has been advanced to sales service manager; while James D. Smith has been named varnish sales manager.

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Erecting Plant Addition

Plans for the immediate construction of a large new plant addition have been announced by Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown, O. The new 80,000-square-foot addition, and its equipment, will be used for the production of wire and textile braided, mandrel built, lead press cured hose. Because of the critical need of the items Republic will manufacture in the new building, in which production will be limited to military requirements during the emergency, the Defense Production Administration has issued a certificate of necessity of $1,841,102 for the project.

Construction will begin immediately, and the company hopes to begin manufacturing in it within 12 months.

The trade will be advised when the facilities are available for civilian goods.

James F. Dollison has joined Republic as field engineer, with headquarters in Youngstown, from where he will contact the industrial organizations of northeastern Ohio and western New York in the interest of the division's industrial rubber products.

To Build in Venezuela

Plans for construction of a $4,000,000 tire and tube manufacturing plant at Valencia, Venezuela, were announced last month by Harvey S. Firestone, Jr., chairman of The Firestone Tire & Rubber Co., Akron, O. This new factory will have 100,000 square feet of floor space initially and will be equipped to produce 150,000 passenger-car and truck tires annually. When operating at capacity, the proposed plant will provide direct employment for about 275 people. The purchase of some raw materials locally will provide indirect employment for others.

Under the corporate name of Cia. Anonima Firestone Venezolana, the plant will be able to supply tires to meet the needs of local automobile assembly plants and Venezuelan motorists.

The Venezuelan plant wll be the third tire and tube manufacturing plant to be built and operated by Firestone in South America. In 1931 tire production was started in Buenos Aires, Argentina, and in 1039 the plant at Sao Pauluo, Brazil, started producing tires and tubes. Textile plants also have been added in these cities by Firestone to manufacture cord fabric for locally produced tires.

Other Firestone foreign tire manufacturing plants are at Hamilton, Ont., Canada; Brentford, England; Port Elizabeth, South Africa; Christchurch, New Zealand; Bombay, India; Bilbao, Spain; Pratteln, Switzerland.

H. G. Weilert, present manager of the Firestone branch in Caracas, is in charge of preliminary arrangements for the building project.

Sun Chemical Corp., 10th St. and 44th Ave., Long Island City 1, L. I., N. Y., recently opened, adjacent to its building, the Suntone colors laboratory of Warwick Chemical Division. This new laboratory is devoted exclusively to problems of color chemistry relating to decorative printing of textiles and plastics. These new centralized quarters also bring together a number of previously separately located laboratories.

Changes at Seiberling

Important shifts in the Seiberling Rubber Co. production staff followed the resignation of Leo F. Pettitt, general production superintendent.

John E. Kallgren was named to the newly created position of plant manager; while Alvin W. McMullen will be production superintendent.

Kallgren, formerly chief engineer, will be in charge of all production and engineering at the company's United States plants. McMullen assumes direct charge of production at the Barberton, O., plant.

Edmund G. Balzano continues as Barberton plant engineer, and Edwin P. Schrank was named chief staff engineer, responsible for design engineering and new and special engineering projects.

Kallgren worked on the engineering staffs of United States Rubber Co. and Firestone Tire & Rubber Co. before joining Seiberling in 1946.

McMullen started in the Seiberling laboratory in 1939; became general foreman of the calendering and tubing departments in 1949, and later also took charge of the accessories and repair materials, milling, and cement mixing operations.

Balzano was named plant engineer last year after service as master mechanic with the company.

Schrank has been with the company as a staff engineer since 1947. He is a son of H. P. Schrank, vice president in charge of production at Seiberling.

Claude Pitts is the new assistant manager of Seiberling's export division, according to Harris A. Waite, general manager of the division. Pitts was with Borg-Warner Corp. 17 years. He served as assistant export manager of the Norge division and later as general product manager of the International Corp.

Promotions of A. Wade Schwab and Richard G. Cattron in the Seiberling sales organization were announced July 14.

Schwab was named manager of mileage sales, replacing C. Sterling Parker, who joined the company's field sales organization on a special assignment. Cattron replaces Schwab as manager of the sales and service laboratory.

Schwab joined Seiberling in 1926 and worked in the Akron sales district until 1937. For the next eight years he worked in the repair material sales of Goodyear Tire & Rubber Co., then returned to Seiberling in 1945 to become the first manager of the firm's sales and service laboratory.

Cattron joined Seiberling's sales and service laboratory staff after two years with the tire repairing and recapping division of the Raney Tire Co., Akron.

Parker, in the mileage sales department since 1943, was named manager in 1946.

American Resinous Chemicals Corp., Peabody, Mass., has appointed Marvin Larson a sales representative in the Chicago area, where he will work in cooperation with the present representative, Sam Palais, who has covered the Chicago area for many years. Mr. Larson, prior to his entry into chemical sales work, was employed for a short time in research activities, then next was a manufacturer's representative in Chicago. He joined the local sales force of General Latex & Chemical Corp. in 1949 and signed with American Resinous a short time ago.

Timken Developments

Bob Wagner, who has been narrating and writing The Timken Roller Bearing Co.'s "Message to Americans" radio program, has joined the advertising department at the Timken plant in Canton, O., as manager of the news bureau and related public relations work. For seven years he was with radio station WBNS in Columbus, first as an announcer, then as newscaster, writer, and public relations director.

Timken is packaging its bearings in metal cans in an attempt to eliminate the damaging effects of moisture and dirt on bearings stored by the Armed Services for replacement purposes. Bearings shipped to the Armed Forces are subjected to severe climatic and storage conditions, and the present method of packaging bearings is considered inadequate for all conditions. Timken has purchased several packaging machines, and a pilot line is being set up to test various methods of packaging bearings in cans and the type of can that is most practical. The new packaging method will be thoroughly tested before it is offered to the Armed Forces. It is believed that canned bearings can be stored without deterioration under the worst conditions for a period of up to 10 years.

Scrap Tube Descriptions

To help identify the different types of automotive inner tubes now on the market and eliminate confusion among scrap rubber dealers, a list of tube descriptions has been issued by Henry M. Rose, H. Muehlstein & Co., Inc., who is president of the Scrap Rubber Institute, National Associations of Waste Material Dealers, Inc.

The descriptions follow: Standard Tubes—natural rubber in red, gray, or black and with no identifying marks; GR-S Tubes—normally have a red line running lengthwise around the tube; GR-I or Butyl Tubes—normally have a blue line running lengthwise around the tube; Neoprene Tubes—usually are red, but sometimes come in black, and have a yellow line around the tube, Life Guard and Similar Tubs—have a rubber exterior and an inner tube made of fabric and rubber and are of much less value than regular tubes; Puncture-Sealing Tubes—have a regular rubber exterior with a soft sealing compound on the inside.

Scrap tubes should be packed in bales, bags, or bundles to prevent loss in transit or at mills, Mr. Rose said. Dealers should place a suitable tag on each package to provide proper identification of tubes and shipper. The full contract price for mixed inner tubes is payable only for natural rubber tubes of standard types. All other grades of mixed tubes are of lesser value, Mr. Rose declared.

Watson-Stillman Co., Roselle, N. J., manufacturer and designer of hydraulic machinery, has appointed Don W. Patterson Co., 2016 Rand Bldg., Buffalo, N. Y., as its exclusive sales representative in western New York State.

H. L. Henry, who previously represented Watson-Stillman in western New York, has been made divisional sales representative of northern Ohio, with headquarters in Akron.

Heads Scott Testers

As a result of the annual meeting of Scott Testers, Inc., held in Providence, R. I., June 15, the following officers were announced.

New president, suceeding his late father, is David C. Scott, Jr., who also continues as sales manager. James M. Scott remains as treasurer and production manager. Diana Scott Worthington becomes secretary; while William G. Ahlson, for some time accountant of the firm, is now assistant treasurer. Other executive personnel remain as before: Harold W. Horton, general sales engineer; Harold R. Rasmussen, in charge of sales, research, and development of the Mooney viscometer division; Enoch B. Bolton, factory superintendent; Robert W. Rogers, chief engineer.

Changes at du Pont

A. J. Smith, Jr., manufacturing superintendent of the Seaford, Del., nylon plant, E. I. du Pont de Nemours & Co., Inc., has been appointed assistant director of sales for "Dacron" polyester fiber, with headquarters at Wilmington, Del. He joined the company in 1941 in nylon sales in Wilmington and four months later was transferred to the New York, N. Y., office. After military service he returned to du Pont in Wilmington to become promotion manager of miscellaneous nylon sales. In 1947, Mr. Smith was promoted to New York district sales manager for nylon and two years later went to the Chattanooga, Tenn., nylon plant as chief supervisor in the manufacturing division. He was advanced to the position of manufacturing superintendent of the Seaford plant in 1950.

Separate organizations to handle manufacturing activities and sales of acetate rayon and "Orlon" acrylic fiber have been established in the company's acetate division.

Thomas H. Urmston, assistant manager of the division, continues in charge of acetate rayon operation; while J. N. Tilley, another assistant manager, will head activities for "Orlon."

William L. Scarborough, manager of the acetate rayon plant at Waynesboro, Va., becomes director of acetate rayon production, with headquarters in Wilmington. A. B. Walmsley, Jr., present director of production, continues in that position in charge of "Orlon." Andrew A. Smith, manufacturing superintendent at Waynesboro, succeeds Mr. Scarborough as manager of the plant.

Henry C. Froehling, an assistant director of sales, is now director of sales for acetate rayon. George S. Demme continues as director of sales for "Orlon"; and Leonard A. Yerkes, Jr., who continues as assistant director of sales for the acrylic fiber, will also be in charge of sales promotion and development and fabric development. W. D. R. Straughn, manager of the technical service section, has been made assistant director of sales for acetate rayon.

Pierre S. du Pont, 3rd, has been appointed assistant director of sales of the rubber chemicals division, organic chemicals department. Mr. du Pont, a director of the company, joined the du Pont organization in 1934 as a chemist at the experimental station in Wilmington; in 1935, was transferred to the industrial engineering division; in 1938, became

Pierre S. du Pont, 3rd

group head of industrial engineering at three rayon department plants, with headquarters at Richmond, Va.; but soon afterward returned to the industrial engineering division in Wilmington, taking charge of mechanical development work for all departments of the company. In July, 1939, he was transferred to the development department as a technical investigator; one year later, took charge of industrial sales and new development work in the nylon division of the rayon department; upon the outbreak of World War II, assumed direction of all military product developments in the nylon division; was appointed assistant director of the trade analysis division, September, 1945; and was made manager of rayon tire yarn sales in November, 1947.

Cyanamid Expanding Output

American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y., has announced two more steps in its expansion program, as follows: (1) installation of equipment to increase melamine production at its Willow Island, W. Va., plant; and (2) expansion of facilities to produce basic chemicals at its Niagara Falls and Welland, Ont., Canada, plants. According to A. O. Williams, vice president of North American Cyanamid, Ltd., the Canadian plants are being expanded to meet demand from both the United States and Canada. The expansion involves the installation of furnaces, liquid air equipment, ovens, and other facilities to increase production of calcium cyanamide at Niagara Falls, and dicyandiamide at Welland. Calcium cyanamide is an important factor in the production of acrylonitrile and some synthetic fibers; while dicyandiamide is required for the production of melamine.

In a move to improve sales and distribution services to customers and at the same time to lower administrative costs American Cyanamid has consolidated its several office and warehouse locations in Chicago, Ill., and St. Louis, Mo., into one newly constructed building in each city. Open-house ceremonies marked the move in Chicago, July 25; while formal opening in St. Louis was held June 26. The two moves are part of an overall company plan which calls for other consolidations in major cities of the United States and Canada.

With the new office and warehouse buildings in operation, the numerous functions performed by the previous locations are handled by one staff under one roof in each city. This policy will permit economic and speedier service to customers. In addition to increasing the efficiency of local sales and distribution activities, the added storage capacity of the new buildings will permit the company to keep on hand in the two areas greater supplies of essential chemicals, dyestuffs, pigments, biologicals, and pharmaceuticals.

American Cyanamid has appointed H. C. Milton assistant district sales manager of the industrial chemicals division at Boston, Mass.

Increasing Facilities

William J. Muller has been made export manager for Southern Alkali Corp., a wholly owned subsidiary of Pittsburgh Plate Glass Co., with headquarters at 30 Rockefeller Plaza, New York 20, N. Y. Mr. Muller was treasurer of the U. S. Alkali Export Association, Inc., prior to joining Southern Alkali and was active in export-import trade 38 years, serving in banking, foreign exchange, and export sales capacities before going to the Association in 1922.

Pittsburgh Plate is constructing an \$8,500,000 expansion of chlorine and caustic soda producing facilities at the Natrium, W. Va., plant of Southern Alkali. The program includes a new cell building for the production of chlorine and an addition to the caustic soda department. In order to get the new plant into production of vitally needed chlorine at the earliest possible date, part of the original plans, which included installation of a turbo-generator for additional power supply, have been discarded. Power for the new plant will be purchased from a local public utility when production is begun in about 18-20 months. Employment at the Natrium plant is now 650, and some 35 additional employes will be added when the new plant opens.

A major expansion of production facilities is also under way at Southern Alkali's Barberton, O., plant, where approximately \$11,000,000 will be spent in expanding Hi-Sil and Silene silica pigment output.

Plant Maintenance Show

The third Plant Maintenance Show will be held January 14-17, 1952, at Convention Hall, Philadelphia, Pa. Held for the first two years in Cleveland O., the show has now been moved to Philadelphia to permit greater attendance from the eastern industrial area. More than 200 companies are expected to participate in the Show, and 156 firms have already contracted for exhibit areas. The Plant Maintenance Conference will be held concurrently with the Show, with L. C. Morrow, *Factory Management & Maintenance,* acting as chairman. The last conference drew attendances of 1,700 at a single session, and the coming conference is expected to be one of the best attended technical sessions in the country. Advance registration cards and hotel information may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y.

More Airfoam Available

Full-scale production on Airfoam, a foamed rubber cushioning material for the West Coast's automotive and furniture industries, was started last month by The Goodyear Tire & Rubber Co., Akron, O., at its Los Angeles, Calif., plant.

Formal opening of the Airfoam wing at the plant was observed June 27 when Lt. Gov. Goodwin J. Knight manipulated controls to pour the first liquid latex into a mold, then moved to the end of the curing chambers to remove an automotive seat from that same mold a few minutes later.

More than $1,000,000 has been invested in equipment and an annex for this latest Goodyear-California operation, covering some 75,000 square feet of floor space. The equipment includes two pouring and curing units for automotive seating and a third for furniture cushioning and miscellaneous items. Employment will be provided 100 persons.

Dent W. Sanford, vice president of the California operations, announced, too, that Goodyear is constructing facilities on a city pier for the unloading and storage of natural latex upon its arrival from company owned plantations in Sumatra and Malaya.

Other company officials participating in the opening ceremonies were Robert W. Maney, Goodyear plant manager, and R. D. Byall, manager of the Airfoam division.

Goodyear Personnel News

E. H. Dours has been made sales manager of the Pliofilm department. With Goodyear since 1948 he has worked with packaging machinery manufacturers in coordinating their machine designs with needs of Pliofilm users in the packaging field. Prior to his affiliation with Goodyear he was sales manager for West Steel Casting Co.

Richard W. Sabine, since 1950 senior staffman in charge of mechanical goods advertising and sales promotion for Goodyear, has been named manager of distributer sales in the mechanical goods division, succeeding the late W. T. Bell. Sabine joined the company in 1942; was assigned to production work in the aircraft subsidiary; entered the squadron training program at Goodyear Aircraft Corp. in 1943; joined the contract termination staff there in 1944; and was appointed staffman in the Goodyear sales promotion department in 1946.

Sheldon R. Harper has been placed in charge of sales promotion and advertising for the mechanical goods division, replacing R. W. Sabine. Harper joined Goodyear Aircraft Corp. in 1940. After Army service and college attendance he joined the squadron training program at Goodyear in 1950 and was transferred to the sales promotion department the same year

M. J. Rhoad, a chemist in fundamental research, has been assigned to the sales staff of the chemical division. Mr. Rhoad has a broad knowledge of synthetic rubbers and resins, having served more than seven years in development of these products in Goodyear's research laboratories. He also has a number of patents pending dealing with the synthesis of high polymers.

Harry L. Powell has been made manager of Goodyear's manufacturers' sales department in Milwaukee; he previously had been manufacturers' sales representative in that area.

William R. Berkinshaw, field representative of the films and flooring division at Detroit, has been transferred in a similar capacity to the Los Angeles district offices.

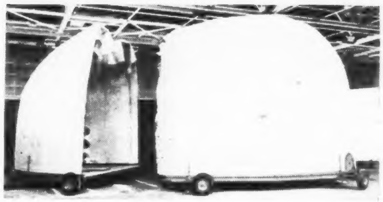
His post in Detroit has been filled by Robert C. Lynes from the Akron district.

Kenneth J. Whisler, another field representative of the films and flooring division, has been transferred from Philadelphia to Dallas, Tex.

The Philadelphia post will be filled by Jay F. Smith, Jr.

Perry E. Ammon, veteran salesman and field representative for Goodyear in the Grand Rapids, Mich., district, retired on company pension, July 1, after 42 years' continuous service with the organization.

P. E. H. Leroy, Goodyear's vice president in charge of finance, was decorated with the Cross with Crown in the Order of Adolphe of Nassau by Her Royal Highness, the Grand Duchess of Luxembourg, during a private audience at the Grand Ducal Palace in Luxembourg, July 9. Leroy was escorted to the audience by H. G. Pownall, managing director of Goodyear-Luxembourg, S. A.



Goodyear Two-Part Inflatable Maintenance Shelter for Bomber Jet Pods

Product Developments

Development of a lightweight, inflatable jet pod maintenance shelter for the Air Force has been announced by Goodyear. The rubberized fabric units are built to fit around the jet pods of the giant B-36 and B-47 bombers and simplify maintenance of the bombers under adverse weather conditions at aviation outposts. As shown on the accompanying photograph, the shelter is built in two sections mounted on mated dollies for maneuverability. The shelter fits around the jet pedestals under the bomber wings and completely encloses the suspended pod in a weatherproof structure 27 feet long, 14 feet high, and 14-2/3 feet wide. Braced on the inside with a series of aluminum stiffeners interlaced with wire cable, the shelter is designed to withstand a wind load of 70 miles an hour when moored, and a snow load of 30 pounds a square foot. The shelter is made of two-play nylon fabric coated with synthetic rubber. The plies are separated by two- to three-inch long dropped pile threads which act as spacers and contribute to the rigidity of the inflated strucure. The dolly also supports a plywood floor and has provisions for electrical connections, and the shelter has a port to admit a hot air heating duct as well as maintenance and personnel doors. An opening at the top where the two sections fit together admits the jet pod, and a drawstring arrangement secures the shelter tightly around the jet pedestal. Both shelter and dolly are designed for compact packaging and speedy assembly. The inflatable sections weigh only 600 pounds, and the 4,025-pound dolly breaks into frame and panel sections moving on their own pneumatic tired wheels.

Operators responsible for transferring fragile articles from place to place can reduce destructive handling losses by use of a new landing mat produced by Goodyear and developed by the firm's Canadian subsidiary. Made of rubber and Airfoam foam latex, the mat has cut handling losses in the paper industry from 30% to practically zero, and seems to have unlimited applications in the materials handling field, it is claimed. The mat consists of a 2½-inch center of firm Airfoam, and top and bottom covers of high-quality rubber each about ½-inch thick. The foam center absorbs the shocks while the covers tie the mat together. These mats are suitable for loading and unloading operations of drums, barrels, crates, and packing cases wherever heavy articles are subject to damage in handling.

Lt. Gov. Goodwin J. Knight *(Left)* Removing the First Finished Piece of Cushioning Material from the Mold at the End of the Conveyer Belt. Helping Him at Dedication Ceremonies for New Million-Dollar Airfoam Wing at Goodyear of California Are *(Center)* Robert W. Maney and *(Right)* Dent W. Sanford

Goodrich Adding to Plants

Construction has begun on a new 53,420-square-foot building at 2940 E. 44th St., which will be the new Los Angeles, Calif., headquarters for five sales divisions of The B. F. Goodrich Co., Akron, O.

This move to the Los Angeles central manufacturing district will bring under one roof, and into an expanded office and warehouse unit, Goodrich sales staffs, some of whose operations cover Southern California, and parts of Nevada, Arizona, New Mexico, and Texas. Divisions include replacement tire sales, industrial products, shoe products, drug sundries, and footwear.

Office space will comprise 8,000 square feet, with 45,420 square feet for the warehousing of tires, tubes, accessories, industrial products, footwear, auto and home supplies. Another 13,320 square feet outside will be devoted to truck dock and customer parking. Siding space will accommodate six trucks and four railroad cars at one time.

A modern kitchen unit adjoining the general offices will provide lunchroom facilities for employes and guests. A controlled heating and ventilating system will also add to employe comfort.

The new building is scheduled for occupancy about November 1.

Another major expansion of the Miami, Okla., tire and tube plant, the third since 1946, was announced July 6 by Walter E. Head, plant manager. Construction work, which will add 110,000 square feet of floor space, will be undertaken as rapidly as building materials are available.

The expansion will add 60,000 square feet of manufacturing space; the balance of the new addition is designed for storage and handling of raw materials and finished goods.

Enlarged power-house facilities are nearing completion, and the plant, with the latest addition, will have nearly a million square feet of floor space and will produce approximately 500,000 pounds of finished goods daily.

A new $5,000,000 industrial belting plant has been completed and is now in full production at Akron, according to E. F. Tomlinson, general manager of industrial and general products. This plant will enable Goodrich to meet the demand for ever-larger conveyer belts to make higher lifts and longer single "flights," to handle heavier loads and harder impacts, he said. BFG now can produce conveyer belting in single rolls weighing up to 35 tons—or as large as existing rail and truck facilities can handle.

Among the features of the new plant are a 664,000-pound press for vulcanizing belts, newest equipment for making steel cable conveyer belts, a humidity-controlled section for manufacturing V-belts, a long belt-building table specially designed with the latest tension control devices, and a complete materials handling system for speedy delivery of raw materials to the production department. A new $235,000 rotary press permits the continuous production of certain types of transmission belting and sheet packing as well as floor matting.

Nearly 40% of the rubber conveyer belting being made in Goodrich's new industrial belting plant at Akron will be delivered to coal, iron ore, and other mines, according to A. Clarke Mack, manager of flat belting sales. The remainder will go to major processing industries, public utilities, and construction projects. More than 1,000 miles of belting have been installed in American mines since 1929. Despite the greater production made possible by the opening of the new plant, Goodrich now has a 500,000-foot backlog of conveyer belting orders on its books, Mack said.

Construction work, to be completed in March, 1952, to house a new large boiler in the main power house of the Goodrich company in Akron is now under way. The boiler, built at a cost of $600,000, is one of the largest ever installed in the Akron area and will replace a number of smaller units.

Product Developments

Goodrich has announced a new electrical tape made with Koroseal vinyl plastic and claimed to have many advantages over ordinary electrical tape. The new tape has a dielectric strength of 8,000 volts, is waterproof, highly abrasion resistant, flameproof, and resistant to acids, oil, alkalies, and corrosive salts. The adhesive backing is non-transferring and can be pressed on to surfaces many times without losing its stickiness. Being extra thin, the tape takes up less room in junction boxes and other tight quarters and stretches and conforms easily to irregular surfaces. This product is packaged in rolls 60 feet long, ¾-inch wide, and 0.007-inch thick.

Small tires cushion the superfast landings of the Navy's Douglas-built rocket plane, recently reported to have been flown at record speed and altitude. The landing wheel tires can withstand an impact load of eight tons, although only two feet by 5½ inches in size, while the nose wheel tire is 20 by 4.4 inches the manufacture claims. According to Goodrich, the pressures carried in these tires are approximately eight times those of automobile tires and twice the pressure ordinarily used in airplane tires. The combined weight of the landing wheel tire and tube is said to be less than that of a 6.70-15 automobile tire.

Radioactive materials are being used in special tires by the Goodrich research center for tests to determine tread wear. According to W. L. Davidson, director of physical research, the method gives instantaneous data and permits the evaluation of such factors as type of road surface, road temperature, speed, tire pressure, and transmission of power on tread wear. Radioactive phosphorous was obtained from Oak Ridge and mixed into the compound for the top tread layer of the special tires. Wear data were obtained by Dr. Davidson by using a portable Geiger counter mounted on a small cart to scan the track made by the radioactive tire. X-ray photographs of the "hot" tire tracks were also taken to measure accurately the amount and the size of the particles worn off the tire. Tire rubber particles blown into the air were gathered by a metal air scoop behind the tire, and the radioactivity of these particles was measured.

A process which is said to clean steel cartridge cases 50% faster than conventional methods in the manufacture of shells for the Army Ordnance Corps has been announced by Goodrich. Known as the B. F. Goodrich-Curran automatic spray pickling machine, the process is used commercially to mass-produce metal articles and has now been redesigned to handle the larger sizes of artillery and mortar shell cases at high production rates. The equipment used in the process is lined with rubber to withstand the highly corrosive action of the pickling acids.

Personnel Changes

Ray Jenkins has been named manager of the Goodrich store at North and Second St., Harrisburg, Pa. He succeeds H. M. Wood, manager since May, 1950, who now becomes territory manager in the Harrisburg area.

After 41 years with the Goodrich company, Edmund C. Slaughter, of the industrial products sales division in Chicago, retired June 29. Slaughter, in the Chicago Goodrich division since 1917, started with the company in Akron, O., and for several years was an assistant to John S. Gulledge, Chicago branch sales manager. Officials of Goodrich from Akron and Chicago and personnel of the Chicago branch held a dinner for Slaughter at the Union League Club on June 29.

Ads Honored

B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, O., received an award for outstanding industrial advertising from the National Industrial Advertisers Association at its recent annual meeting at the Waldorf Astoria Hotel, New York, N. Y. The award was made to M. M. Osborne, Jr., manager, advertising, publicity, technical data service for the advertising campaign on Geon polyvinyl materials and Hycar American rubber directed to the top management in manufacturing industries and to operating management in specific fields such as plastics rubbers, textiles, and paper.

Hycar Uses

Hycar nitrile rubber, a product of Goodrich Chemical, has found use in two widely different types of products. Dairy Whipt Division, Aerated Container Corp., Chicago, Ill., is using an oil resistant Hycar sealing component in the manufacture of aerosol valves. Tailored to fit the particular application, the sealing compounds are used in pressure packages holding such products as shampoos, shaving creams, whipped creams, etc.

Hycar is also being used by Valve Engineering & Developing Co., Tulsa, Okla., in the manufacture of the Fluidynamic Desurger, which is said virtually to eliminate damaging pulsations and shock in oil pipe lines caused by pumping and valve actions. Without the physical properties of Hycar and its resistance to drilling chemicals and hydrocarbons, the Desurger could not be operated economically or efficiently, it is also claimed.

New York Quartermaster Procurement Agency, 111 E. 16th St., New York 3, N. Y., recently announced the awarding of contracts for the following: *synthetic rubber coated raincoats,* to Cable Raincoat Co., Boston, Mass.; *rubber electrical shock protecting gloves,* Wilson Rubber Co., Canton, O.; *rubber insulated combat boots,* Bristol Mfg. Corp., Bristol, R. I., United States Rubber Co., Naugatuck, Conn., Hood Rubber Co., Watertown, Mass., Cambridge Rubber Co., Taneytown, Md., and Goodyear Rubber Co., Middletown, Conn.

Broadens Plastics Output

The General Tire & Rubber Co.'s plastic plant at Jeannette, Pa., after a year of limited manufacturing of vinyl dry goods films, is now undergoing an extensive program to expedite full-scale production.

The trade name "Luxon", already appearing in national advertising, has been chosen to cover all of the company's vinyl-type plastic products.

Among other "Luxon" items slated for greater production is General's semi-rigid, transparent vinyl — currently being produced for government orders. With the availability of raw materials and increased facilities, General is looking forward to a substantial distribution of this product for commercial applications.

The production of rigids—both transparent and colored—for industrial uses will soon be ready for marketing, as will the output of leather-type vinyls on which the large-scale production runs have already been made.

Announcement was also made that the basic laboratory work has been completed on General's vinyl-type packaging film, another "Luxon" development. Limited production of this film is scheduled to start in September.

Bellows in Retail Sales Post

Howard A. Bellows, eastern division sales manager of General Tire, has been transferred to the company's main offices in Akron, O., to takeover the duties of S. S. Poor as manager of retail merchandising.

Associated with the company 32 years, Mr. Poor has assumed new duties. Besides being vice president, he is also on the board of directors.

Mr. Bellows has been with General for 26 years, mostly in eastern division sales. Originally hired as territory salesman for Virginia and the eastern half of North Carolina, Bellows moved into New York in 1928 as branch manager. The eastern division, which includes New York, Philadelphia, and Richmond branches, was formed in 1937, and Bellows was promoted to direct it.

Friction Materials Standards Institute, Inc., 370 Lexington Ave., New York, N. Y., at its recent annual meeting elected the following officers for the year starting July 1: President, Franklin A. Miller, Raybestos-Manhattan, Inc.; vice president, Frederick C. Weyburne, Marshall-Eclipse Division; treasurer, Vincent A. Spina, Scandinavia Belting Co.; secretary, Miss Harriet G. Duschek; members of the board of directors, serving with these officers, George E. Ritter, Molded Materials Division; Frank Barton, Rossendale-Ruboil Co.; Amor P. Smith, Russell Mfg. Co.; Wm. A. Blume, Asbestos Mfg. Co.; Jos. G. Brown, Grizzly Mfg. Co.

Pennsylvania Rubber Co., Mansfield, O., as the first step in a personnel-expansion program, has placed Paul E. Finical in the advertising department to work on sales promotion. His duties will include the submission of articles to newspapers, magazines, and trade publications concerning Pennsylvania Rubber, its research, sales innovations, company-dealer relations, and personnel.

Howard A. Bellows

Dewey & Almy Chemical Co., 62 Whittemore Ave., Cambridge 40, Mass., is manufacturing for General Radio Co. what are claimed to be the first rubber sleeves designed specifically for insulating audio transformer coils. The new sleeves, which slip easily into place, speed transformer production by replacing the slower method of insulating coils with a series of varnish coatings. Development of the rubber sleeve was made possible by the dip method of manufacturing which permits accurate formulation of hollow, odd shaped rubber components to specified dimensions. Neoprene is used for the sleeve because of its higher heat resistance.

W. C. Hardesty Co., Inc., 41 E. 42nd St., New York 17, N. Y., has appointed George F. Long to its textile sales engineering staff. Mr. Long with 15 years' experience in technical sales work in the textile industry, will sell Hardesty's complete line of fatty acids, and his textile training and experience will be available to anyone needing technical service on the use of these acids in the textile field.

OBITUARY

Joseph P. Maider

JOSEPH P. MAIDER, production manager of the chemical production department, Goodyear Tire & Rubber Co., Akron, O., died suddenly at his desk on June 27.

Mr. Maider was born August 16, 1886, in Phoenix, N. Y. He was graduated from Cornell University in 1911 with a bachelor of chemistry degree.

Prior to joining Goodyear on October 31, 1917, Mr. Maider had been city chemist for Spokane, Wash., for six years. He filled several positions for the rubber company before going into tire compounding in 1924. He remained there until 1931, when he went into process development and compound control. From 1933 to 1935 he was in research and then became executive assistant in Pliofilm. The following year Mr. Maider was appointed assistant manager of that department, and one month later became manager of chemical products; next he was made production manager of chemical production.

The deceased was a member of the American Chemical Society; The American Institute of Chemical Engineers, and the Torch Club.

Funeral services were held June 29 at the Billow Chapel, Akron. Interment was at Pine Plains Cemetary, Clay, N. Y.

Mr. Maider is survived by a sister and two brothers.

Joseph W. Roberts

FUNERAL services were held in Akron, O., July 11 for Joseph W. Roberts, assistant comptroller of The Goodyear Tire & Rubber Co., who was fatally stricken with a heart attack at his home, on July 8. Interment followed in Rose Hill Burial Park.

With Goodyear 34 years, he had assumed his duties as assistant comptroller last April. Prior to that time he had served as chief works accountant in charge of all domestic manufacturing operations.

The deceased was born August 29, 1892, at Blue Rock, O. He was a graduate of the Meredith Business College, Zanesville, O.

During World War I, Mr. Roberts spent a year with the 84th Division, A.E.F., as a member of the 309th Engineers Battalion. He was also active in Masonic circles and belonged to the High Street Church of Christ.

Surviving are the widow, a son, and a brother.

Otto Bachle

OTTO BÄCHLE, 48, of the rubber and synthetics division of the research laboratory of Farbenfabrieken Bayer, Leverkusen, Germany, died March 14, after a long illness.

Dr. Bächle joined the rubber laboratory of the Bayer works in 1928 soon after obtaining his doctorate. He made important contributions to the subject of copolymerizations and copolymers (Buna and Perbunan) until 1932, when work on synthetic rubber was temporarily shelved at Farbenfabrieken Bayer following the prolonged slump in the price of natural rubber. The deceased then turned to natural latex and rubber dispersions, devoting special attention to the colloid chemistry involved; he developed a large number of testing methods and processes, also in connection with combinations of textiles and rubber, as in tire fabrics.

Joseph S. Michtom

JOSEPH S. MICHTOM, retired dentist, who was secretary of Ideal Toy Corp. and president of Ideal Plastics Corp., both of Hollis, N. Y., died of a heart attack, June 21, while playing golf.

He was born in Newark, N. J., 61 years ago. The deceased was graduated from Columbia University in 1908 and from New York University Dental School in

1915. He practiced dentistry for 22 years before joining Ideal Novelty & Toy Co., now Ideal Toy Corp., which had been founded by his father, the late Morris Michtom. Dr. Michtom was also a former president of another subsidiary, Ideal Rubber Co., Brooklyn, N. Y.

Dr. Michtom was a member of the board of directors of Beth-El Hospital, Brooklyn, for 12 years, a vice president for six, and president since January, 1951. He also belonged to several Manhattan and Brooklyn dental societies and the Conference on Jewish Relations.

Surviving are a son, a daughter, a sister, a brother, and four grandchildren.

Francis A. Truslow

FRANCIS ADAMS TRUSLOW, former president of the New York Curb Exchange, died suddenly July 8 aboard ship while en route to Rio de Janeiro. Mr. Truslow was going to Brazil to commence duties as head of the United States-Brazil Joint Commission for Economic Development.

Thoroughly acquainted with economic conditions in South America, particularly in Brazil, Mr. Truslow during World War II headed the Rubber Reserve Co., a United States government agency, set up to exploit South American rubber production. His great interest in the development of the rubber industry induced him to rewrite the corporation trust and navigation laws of the Republic of Liberia. He received decorations from both the Liberian and Peruvian governments.

He was born in Summit, N. J., May 4, 1906. Mr. Truslow was graduated from Yale University in 1928 and from Harvard Law School in 1932.

Besides being a member of the Council on Foreign Relations and treasurer of the Public Education Association of New York, the deceased was affiliated with the University, Downtown, and Associated Anglers Clubs of New York and the Nacional Club, Lima, Peru.

Surviving are his wife, two sons, and two daughters.

Funeral services were held at the Madison Ave. Presbyterian Church, New York, N. Y., July 13, followed by private interment in Cold Spring Harbor.

D. S. Dunwiddie

DEDERICK STANLEY DUNWIDDIE, secretary-treasurer of Cia. Goodyear del Peru, the Goodyear subsidiary in Lima, died July 24 following a heart attack. Mr. Dunwiddie had returned to Akron, and at the time of his death was on home leave.

He was born in Broadhead, Wis., May 8, 1908.

He began service with Goodyear in 1934 as a clerk in the treasurer's office at Akron and he was named senior clerk in 1936. Two years later he left for Brazil where the Goodyear factory was being constructed in Sao Paulo, and he served with the operating department there until 1941. He was next appointed operating manager of the Goodyear organization in Argentina and held this post until 1945, when he was named secretary-treasurer for Goodyear-Peru.

He is survived by his widow.

NEWS ABOUT PEOPLE

Harry Armstrong, Sr.

Harry Armstrong, Sr., has been appointed assistant secretary of Cameron Machine Co., 61 Poplar St., Brooklyn 2, N. Y. Mr. Armstrong has been with the company 22 years. He started on the engineering staff, and in 1940 was made chief draftsman. In June of last year he was named manager of the service department and will continue in that capacity in addition to his new duties.

Edgar S. Thompson has been appointed director of development for the coated products division, Interchemical Corp., New York, N. Y., where he will coordinate the chemical, engineering, and research efforts in the development of all new products. He is also a member of the defense contract and development committee of the division. Mr. Thompson has been with Interchemical for the past three years, handling assignments associated with product development. From 1946 to 1948 he was manager of the rubber and plastics machinery division of Farrel-Birmingham Co., Inc., and prior to that time served six years with Armstrong Cork Co., as plant engineer in the wall board, accoustical, and insulation plant at Pensacola, Fla., and as project engineer on war production, plant expansion, and modernization at Lancaster, Pa. From 1936 to 1940, Mr. Thompson was employed by the General Chemical Co. Division, Allied Chemical & Dye Corp., devoting most of his efforts to process development of heavy chemicals.

John F. Corwin has been appointed by the Office of Price Stabilization, Washington, D. C., chief of the Resins, Plastic Materials and Adhesives Section, Chemical and Drugs Branch, Rubber, Chemicals and Drugs Division. Mr. Corwin is on loan from the chemical division of Koppers Co., Pittsburgh, Pa. He was chemical director with the Borden Co., chemical division, New York, N. Y., 1944-1949, and was associated with American Cyanamid Co. in the plastics division in 1943-44. He also served as chief of the Resins and Plastic Materials Division of OPA.

Marshall L. Havey, having reached retirement age has resigned as executive vice president of The New Jersey Zinc Co., 160 Front St., New York 38, N. Y., but will continue, on a parttime basis, on special assignment as assistant to the president.

Elmer French has been promoted to vice president in charge of sales, Firestone Plastics Co., Pottstown, Pa. This post was newly created because of the plans for additions to the Pottstown plant resulting from the rapid expansion of Firestone's plastics activities. Mr. French has been with the Firestone organization for ten years. He served as manager of retail sales for the parent concern, The Firestone Tire & Rubber Co., Akron, O., and later transferred to the plastics company as general sales manager when it was organized in 1947.

Albert A. Hally has been named sales manager of the industrial and commercial department of Industrial Tape Corp., New Brunswick, N. J. With the company since 1948, he most recently was sales manager and merchandising director of Texcel cellophane tape.

John J. Hager has joined Pioneer Latex & Chemical Co., Middlesex, N. J., to be in charge of the development and sale of adhesives and products for the automotive trade. Mr. Hager was with the International B. F. Goodrich technical services department for the past five years and with The B. F. Goodrich Co. for 13 years and did considerable work on cements and coated fabrics.

George E. Martin has been made head of the technical service division, Aldan Rubber Co., Philadelphia, Pa. Mr. Martin was technologist in charge of coated fabrics development for the Army Quartermaster Corps research laboratories. He is a member of the Philadelphia Rubber Group, the American Association of Textile Chemists & Colorists, and on the Coated Fabrics Committee of the American Society for Testing Materials. The Aldan firm, which has specialized in coating and combining fabrics since the year 1909, is presently engaged in expanding its plant facilities.

Charles P. Steuber has resigned from Carbide & Carbon Chemicals Co. to establish his own foreign sales organization, C. P. Steuber & Co., 11 W. 42nd St., New York 17, N. Y., which will specialize in handling foreign sales for American producers of chemicals and related products and will also act as the American purchasing and sales representative for a number of foreign companies. Mr. Steuber was with Carbide & Carbon more than nine years—principally with the foreign department. He spent several years traveling in Europe as manager of the chemicals division of the UCC foreign sales subsidiary, Union Carbide Europa S. A. Prior to that service he was engaged in chemical sales within the U.S.A. Mr. Steuber started with Carbide at the Mellon Institute of Industrial Research.

Charles G. Stupp has been appointed technical director of the Barrett Division, Allied Chemical and Dye Corp., 40 Rector St., New York 6, N. Y., where he will be in charge of research and development as well as the technical control of products and processes for manufacturing. Mr. Stupp replaces S. P. Miller, who will continue with Barrett in an advisory capacity. Mr. Stupp previously served Barrett as technical supervisor for manufacturing and During World War II was works manager for the chemical plant in Philadelphia. He came to Barrett in 1916, transferred to National Aniline Co. in 1922 shortly after Allied was formed, but returned to Barrett in 1927.

John M. Robinson, vice president-finance, The DeVilbiss Co., Toledo, O., was elected to the board of directors at a recent special meeting. He started with the company as treasurer in 1946, with a background of industrial accounting and public tax and accounting work. In January, 1950, he was advanced to vice president and treasurer and in April, 1951, to the financial vice presidency.

WEST

Wins Art Awards

Illustrations appearing regularly in India Rubber World for Sid Richardson Carbon Co., Fort Worth, Tex., have won two first prizes for Paul LeMay in the annual art exhibit of the Fort Worth Advertising Club. The western silhouette-type drawings were judged the best trade paper advertising art in the show. They carried off top honors as the best black and white drawings also.

Sid Richardson Carbon Co. advertising is handled by the Yates Advertising Agency, Fort Worth.

Dow Chemical Co., Midland, Mich., has sold its 20% interest in Thiokol Corp., Trenton, N. J., to a group of eastern investors. Dow acquired a stock interest in the New Jersey firm in 1939 during which time it was manufacturing for Thiokol a synthetic rubber used in special industrial and military applications because of its oil resistant and self-sealing properties. In 1948, Thiokol Corp. built its own manufacturing plant, and Dow discontinued production of the material.

Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, O., has announced plans for expansion of its sodium silicate plant at Dallas, Tex. According to W. H. Evans, general manager of silicate operations, this is the fourth expansion of the plant within 10 years to meet growing demand for the chemicals in the Southwest. Estimated to cost several hundred thousand dollars, the project calls for the installation of a large furnace to supplement the production of three smaller furnaces now in operation. The present furnace building will be remodeled to accommodate the expanded facilities. Full production of the new facilities is expected early in 1952.

Charles G. Stupp

Edwin L. Wiegand Co., Pittsburgh 8, Pa., has announced that its Chromalox electric radiant heaters are being used by Lien Rubber Mfg. Co., Los Angeles, Calif., for curing foam sponge rubber. Production at Lien has been increased 50% by converting from hot water to infrared heating for the curing stage. Foam quality has also been improved, it is also claimed, because the former method left water spots on the finished product and resulted in a large number of rejects. In the new method, the foam compound is poured into aluminum molds that are immediately conveyed through the 42-foot long, zoned infrared oven. The first zone provides rapid heating; the second zone adjusts the mold temperature to 200° F., and the remaining zones maintain this required temperature. Thirty 1.8-kilowatt Chromalox heaters are used in the installation and are distributed equally at the top and the bottom of the oven to assure uniform heating. Input controllers are used to keep the mold temperature within close limitations. After leaving the oven, the molds are water cooled to bring the temperature down to about 70° F. In addition to increasing production by accelerating the curing period, the all-metal heaters withstand rough handling and splashing from passing molds.

Witco Chemical Co., 295 Madison Ave., New York 71, N. Y., at a recent board meeting in Chicago, Ill., elected as a director Max A. Minng, vice president in charge of the carbon black division. At the same time William Wishnick was appointed assistant treasurer.

Shell Chemical Corp., 50 W. 50th St., New York 20, N. Y., has transferred J. J. Lawler, manager of the St. Louis district office, to the managership of the Chicago district office. James K. Robbins, Jr., now holds the St. Louis post.

Lawler has more than 14 years' experience with Shell. Since graduating from the University of Missouri in 1937, he has been engaged in administrative and sales capacities in Shell Oil Co. and Shell Chemical.

Robbins has been engaged in chemical sales for more than 15 years. As with Lawler, his new position calls for marketing the company's organic chemicals including solvents, industrial chemicals, plastics, and resins.

CANADA

Needles Succeeds Sawin

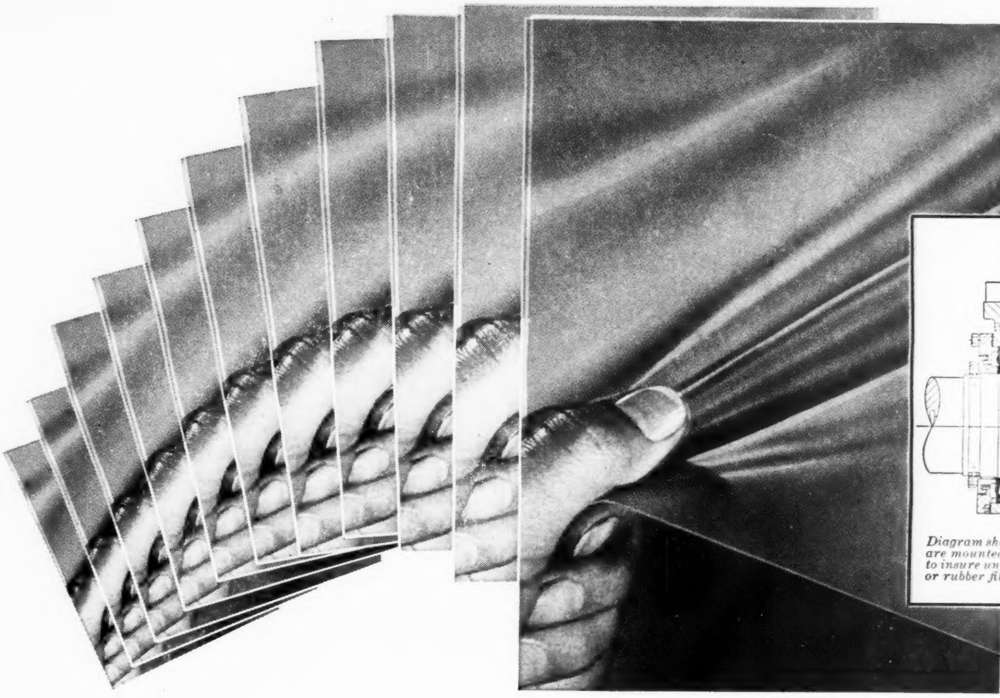
George Walker Sawin, president, The B. F. Goodrich Rubber Co. of Canada, Ltd., Kitchener Ont., since 1941 has resigned for reasons of health. Mr. Sawin, with the Goodrich organization since 1913, was first a tire salesman in Philadelphia, Pa., for The B. F. Goodrich Co., Akron, O., became assistant manager in Buffalo in September, 1913, manager of tire sales in Chicago in 1919, Chicago branch manager in 1920, New York district manager in 1924, returned to Chicago as branch manager in 1926, and later that year was named tire sales manager with headquarters in Akron, O. In 1929 he became eastern district manager and in 1931 Philadelphia district manager. Mr. Sawin was elected vice president and general manager of Goodrich of Canada, in 1936 and five years later became president.

Ira G. Needles, since 1945 vice president of Goodrich of Canada, succeeds Mr. Sawin as president of the company. Mr. Needles joined The B. F. Goodrich Co. in 1916 and in 1925 became a member of the Canadian organization. He was assistant sales manager of the tire division until 1930, when he was made general tire sales manager.

St. Regis Paper Co. (Canada), Ltd., Panelyte Division, Montreal, P.Q., has begun the production of laminated plastics at its new plant at St. Johns, P.Q. A steady increase in output is expected until capacity operation is attained at the plant this fall. Ground was broken for the plant a year ago in a program to supply the requirements of the Canadian market for Panelyte laminated plastics. According to Plant Manager Charles L. Walters, the St. Johns facilities cover 70,000 square feet of floor space and include the most modern designs in industrial layout and equipment. The five presses now installed will be able to turn out a complete line of refrigerator molded parts, industrial shapes, and decorative parts. Representing an investment of more than $2,000,000, the new plant will provide employment for about 300 persons when capacity operation is reached. The Canadian plant will have full advantage of the technical knowledge of the Panelyte Division's organization in the United States, according to C. Russell Mahaney, St. Regis vice president and general manager of the division.

Dow Chemical Co. of Canada, Ltd., Toronto, Ont., recently made the following appointments. R. H. Wright is now manager of the Montreal, P.Q., branch office and is succeeded as manager of the Toronto branch office by G. M. Scott, manager, plastics sales division and coatings and solvents sales division. That post is now held by R. M. Munro.

J. R. Nicholson, who recently resigned as executive vice president of Polymer Corp., Ltd., Sarnia, Ont., Canada, has been appointed executive vice president of the management company in Brazil of Brazilian Traction, Light & Power Co., Ltd.



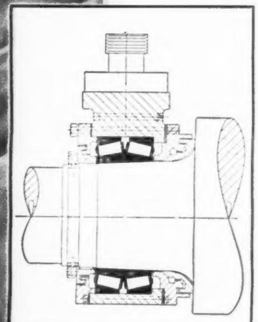


Diagram shows how calender rolls are mounted on Timken bearings to insure uniform sheets of plastic or rubber film.

FINANCIAL

American Hard Rubber Co., New York, N. Y. Twenty-four weeks to June 17: net profit, $582,577, equal to $5.99 a common share, contrasted with $224,343, or $1.94 a share, a year earlier; net sales, $11,539,835 against $6,521,666.

Boston Woven Hose & Rubber Co., Cambridge, Mass. September 1, 1950-May 31, 1951: net income, $973,629 equal to $10.88 a common share, contrasted with $216,801, or $2.02 a share, a year earlier; sales, $19,400,479 against $10,317,956.

Circle Wire & Cable Corp., Maspeth, L. I., N. Y. First half, 1951: net profit, $1,182,059, equal to $1.57 a share.

Collins & Aikman Corp., Philadelphia, Pa. Quarter ended June 2, 1951: consolidated net profit, $792,000, equal to $1.40 a common share, against $371,000, or 66¢ a share, in the corresponding period of 1950.

Dewey & Almy Chemical Co., Cambridge, Mass. First half, 1951: net earnings, $901,746, equal to 99¢ a common share, against $679,770, or 74¢ a share, in the 1950 half; sales, $15,069,357, against $9,003,491.

Diamond Alkali Co., Cleveland 14, O., and subsidiaries. Six months ended June 30, 1951: net income, $3,726,726, equal to $3.43 each on 1,086,854 shares, compared with $2,297,646, or $2.11 a share, in the like period last year; net sales, $38,959,467, against $27,679,744.

Eagle-Picher Co., Cincinnati, O., and domestic subsidiaries. First half, 1951: consolidated net profit, $1,819,021, equal to $2.02 a share, compared with $759,772, or 85¢ a share in the first half of 1950; net sales, $43,099,050, against $26,890,812.

Endicott Johnson Corp., Endicott, N. Y., and subsidiaries. First six months, 1951: net profit, $879,724, against $870,626 in the similar months last year; net sales, $75,544,282, against $55,611,275.

Firestone Tire & Rubber Co., Akron, O. Six months ended April 30, 1951: consolidated net profit, $23,082,048, equal to $11.69 a common share, against $13,320,055, or $6.68 a share, a year earlier.

General Electric Co., Schenectady, N. Y., and consolidated affiliates. First half, 1951: net income, $70,325,616, equal to $2.44 each on 28,845,927 capital shares, compared with $77,444,992, or $2.68 a share in the '50 half; sales, $1,184,735,404, against $881,050,242.

National Automotive Fibres, Inc., Trenton, N. J. First six months, 1951: net profit, $2,747,963 equal to $2.76 a share, compared with $1,566,116, or $1.57 a share, in the first half last year.

General Tire & Rubber Co., Akron, O., and subsidiaries. Six months ended May 31, 1951: net profit, $3,411,779; net sales, $84,449,157.

Hewitt-Robins, Inc., New York 17, N. Y. First half, 1951: net earnings, $633,844, equal to $2.27 a common share, against $423,130, or $1.52 a share, in the first half of 1950; net sales, $18,066,679, against $9,723,324.

Johns-Manville Corp., New York, N. Y., and subsidiaries. First half, 1951: net income, $12,593,038, equal to $3.98 a common share, compared with $10,100,687, or $3.26 a share, in the first half of 1950; sales, $128,331,613, against $88,493,577.

Monsanto Chemical Co., St. Louis, Mo. First six months, 1951: net income, $12,696,000, equal to $2.55 a common share, compared with $12,337,000, or $2.52 a share, in the like period last year; sales, $139,743,000, against $102,704,934.

Okonite Co., Passaic, N. J. Six months to June 30, 1951: net earnings, $745,116, equal to $5.24 a common share, compared with $306,522, or $2.15 a share, in the corresponding period last year.

Pittsburgh Coke & Chemical Co., Pittsburgh, Pa., and subsidiaries. Six months ended June 30: net profit, $1,907,000, equal to $3.30 a common share, contrasted with $1,333,452, or $2.27 a share, a year earlier.

Plymouth Rubber Co., Canton, Mass. Six months ended May 31, 1951: net earnings, $531,009, equal to 59¢ each on 900,000 capital shares outstanding, against $209,198, or 23¢ a common share, a year earlier.

Rome Cable Corp., Rome, N. Y. Second quarter, 1951: net income, $489,043, equal to $1.05 a common share, against $260,256, or 60¢ a share, in the same period last year.

St. Joseph Lead Co., New York, N. Y. First six months: consolidated net income, $7,729,138; equal to $3.13 each on 2,469,320 capital shares, contrasted with $4,121,165, or $1.67 a share, a year earlier; net sales, $58,399,748, against $44,848,764.

Seiberling Rubber Co., Akron, O., and subsidiaries. First half, 1951: net income, $675,427, equal to $1.86 a common share, against $581,998, or $1.53 a share, in the corresponding half of 1950; net sales, $22,123,570, against $15,130,847.

Shell Oil Co., New York N. Y. Six months to June 30: net income, $46,495,231, equal to $3.45 a share, against $39,478,935, or $2.93 a share, in the six months ended June 30 1950: sales, $517,273,387, against $422,443,975.

Skelly Oil Co., Kansas City, Mo. First six months, 1951: net earnings, $14,405,385, equal to $5.51 a common share, contrasted with $11,674,227, or $4.46 a share, a year earlier.

Socony-Vacuum Oil Corp., Inc., New York, N. Y. First half, 1951: net earnings, $76,000,000, equal to $2.39 a share, compared with $45,000,000, or $1.41 a share, a year earlier.

Sun Oil Co., Philadelphia, Pa., and subsidiaries. Six months to June 30: net earnings, $22,712,149, equal to $3.77 each on 5,965,726 common shares, against $13,150,663 or $2.39 each on 5,425,546 shares, in the like period last year.

U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y. Twenty-four weeks to June 17: net earnings, $254,211, against $61,032 in the corresponding weeks last year.

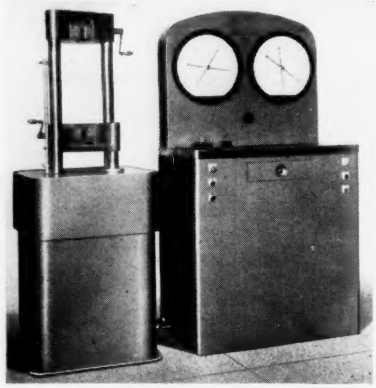
Union Carbide & Carbon Corp., New York, N. Y., and subsidiaries. First six months, 1951: net income, $58,227,904, equal to $2.02 each on 28,806,344 capital shares, compared with $60,805,199, or $2.11 a share in the corresponding period of 1950; net sales, $458,307,745, against $330,840,573.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Anaconda Wire & Cable Corp	Com.	$0.75	July 24	July 13
Baldwin Rubber Co.	Com.	0.30 extra	July 26	July 16
		0.15 q.	July 26	July 16
Boston Woven Hose & Rubber Co	Com.	0.50 q.	Aug. 25	Aug. 15
Detroit Gasket & Mfg. Co.	Com.	0.25 q.	July 25	July 10
Devilbiss Co	Com.	0.25	July 20	July 10
Firestone Tire & Rubber Co.	Com.	1.50 incr.	July 20	July 5
Goodall Rubber Co.	Com.	0.15 extra	July 2	June 25
	Com.	0.15 q.	Aug. 15	Aug. 1
Goodall Sanford Co.	Pfd.	1.00 q.	Sept. 1	Aug. 15
Goodyear Tire & Rubber Co.	Com.	0.75 new	Sept. 15	Aug. 15
	Com.	100% stock		Aug. 15
	$5 Pfd.	1.25 q.	Sept. 15	Aug. 15
Goodyear Tire & Rubber Co. of Canada, Ltd.	Pfd.	0.50 q.	July 31	July 10
Hewitt-Robins, Inc	Com.	0.40 q.	Sept. 15	Aug. 31
Intercontinental Rubber Co.	Com.	0.40 resum.	July 25	July 9
Johnson & Johnson Co.	Com.	1.00 q.	Aug. 1	Aug. 1
Lee Rubber & Tire Corp	Com.	0.75 q.	Aug. 1	July 16
Okonite Co	Com.	0.50 incr.	Aug. 1	July 16
Swan Rubber Co.	Com.	0.75 q.	July 2	June 22
Thermoid Co.	Pfd.	0.62½ q.	Aug. 1	July 20
Tyer Rubber Co.	$4.25 Pfd.	1.06¼ q.	Aug. 15	Aug. 6
Whitehead Bros. Rubber Co.	Com.	0.15 extra	July 2	June 25
	Com.	0.15 q.	Aug. 15	Aug. 1
Whitney Blake Co.	Com.	0.15 q.	July 16	July 3

New Machines and Appliances

Improved Testing Machine



Baldwin's New Model 12-H Universal Testing Machine

AN IMPROVED, low-cost, universal testing machine of 12,000 pounds' capacity has been announced by Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa. Designated the Model 12-H, the new machine has many of the features of the larger Baldwin machines, including the use of a hydraulic loading unit separate from the indicating and control unit to isolate recoil and permit adjustment of hands with minimum drag. An exceptionally rigid design with 9½ inches of clear lateral space between the two columns gives high accessibility and simplifies observations. Loading in either tension or compression is applied upward by an integrated piston and elevating cage with an eight-inch stroke. Loading speed can be varied infinitely between 0-10 inches a minute.

The lower gripping head is the upper member of a second adjustable cage and is positioned by a motor drive mounted on the lower crosshead. This drive moves the cage at a speed of 10 inches a minute and provides an adjustment range of 20 inches. The vertical distance between the gripping heads can be set from 1-21 inches. The table, arranged for transverse testing, is drilled to secure standard transverse tools at spans of 10, 12, 16, 18, 22, and 24 inches. The machine has two loading ranges: a 12,000-pound range graduated in 20-pound units, and a 3,000-pound range graduated in five-pound units. Other ranges can be provided in any dual combination. Other features of the machine include push button controls; use of three control valves for loading; automatic safety devices to prevent overloading of gages and over-travel of moving parts; and use of precision Emery-type Bourdon loading gages. A standard Baldwin recorder can be used with the machine, if desired.

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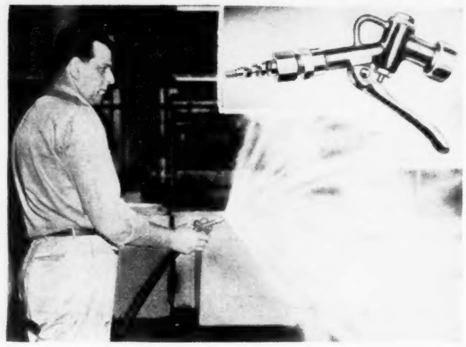


Bete Fog Gun Nozzle for Use with Garden Hose in Fire Fighting

Fog Gun for Fire Fighting

A UNIQUE fog gun developed by Bete Fog Nozzle, Inc., Greenfield, Mass., makes it possible for factories to convert ordinary garden hose into a mobile and effective inside fire fighting weapon. With the new gun-type nozzle, a water-tap pressure of only 30-120 pounds will produce an effective fog that will instantly blanket and extinguish small fires, the manufacturer claims. This fog is effective against practically any kind of fire, including oil, textile, electrical, and others.

Featuring instantaneous trigger action and positive shut-off, the fog gun can also be used for many factory spraying applications, including dust laying, cooling of machines and molds, washing materials, and spraying lubricants. Nozzles are available either separately or in a kit which includes adaptors for giving a complete spray range.

BELGIAN CONGO

At the beginning of the present century, before plantation rubber came into its own, Belgian Congo was an important source of wild rubber, contributing about 10% of the world's total supply of rubber at the time. In 1901 exports reached a peak of around 6,000 tons, which was not to be attained again until 1943, when the war demands revived interest in wild rubber, and shipments jumped to 6,210 tons, rose further to 9,611 tons in the following year, only to decrease rapidly once more until they have now practically ceased. The Belgian Congo exports of rubber in 1949, which amounted to 6,753 metric tons, were practically all plantation rubber, including only nine tons of wild rubber.

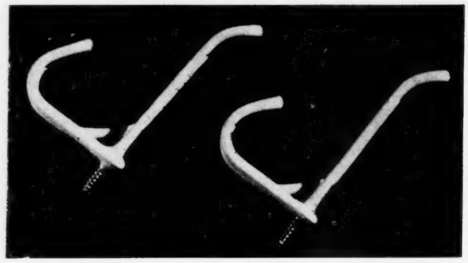
The first attempts at planting *Hevea* here date back to 1896, but results were not encouraging; later plantings with Ceylon and Malayan seed were more successful; however, even up to 1920, the colony had not exported more than 100 tons of plantation rubber. Real development began only after 1933 when buddings of the best Far Eastern clones were imported by the National Institute for the Study of Agronomy in Belgian Congo, and the industry was put on a more scientific basis.

Progress here has been slow, for while the climate is suitable for *Hevea*, growers have had to overcome many difficulties including the prevalence of root disease due to the quality of the soil; and the frequently inadequate factory equipment, which could not be replaced because of the war. Labor, moreover, while of improved efficiency, continues scarce so that plantations on the scale common in the Far East, have so far been impossible here. The quality of the product also left much to be desired until, on the insistence of the local rubber producers' association, the government began, in July, 1950, to control quality by requiring export certificates which all, except a few important concerns whose product is known to be uniformly good, must have before being permitted to ship rubber abroad. The quality of the rubber now exported—smoked sheet and more recently also crepe—is reported to be up to standard.

The area of European-run plantations in 1949 is given as 56,386 hectares, of which about half is tappable; the newer plantings are expected to yield 1,000 to 1,500 kilograms per annum (about 900 to 1,200 pounds per acre). The total yield of plantation rubber in Belgian Congo was put at 8,000 metric tons in 1950, and by 1953 an increase to 20,000 tons is looked for.

(*Continued on page 622*)

New Goods and Specialties



New Vinyl Coated Coat and Hat Hooks

Plastic Coated Hooks

CLOTHING of all kinds, even smooth silks or starched shirts, are kept from slipping off new coat and hat hooks by a protective coating of Vinylite vinyl resin, a product of Bakelite Co. These hooks have sharp gimlet points that permit them to be screwed easily into most doors, walls, or closet moldings by hand. The non-skid plastic coating on the hooks will neither chip nor rust, is durable and highly resistant to abrasion and wear, and is available in a range of permanent colors, according to the manufacturer, Washburn Co., Worcester 8, Mass.

Vinyl Plastic Lampshades

New Lampshades Made with Textured Vinyl Plastic Film

LUXURY lampshades that look and feel like fine silk are being manufactured by Michael Lamp Shade Corp., New York, N. Y., from a newly developed, textured Vinylite plastic film that is both durable and easily cleaned. The plastic shades filter light in the same way as fabric and are available in a wide variety of popular sizes, shapes, and colors with matching or contrasting linings. The plastic, made by Bakelite Division, Union Carbide & Carbon Corp. and embossed by Victory Plastics & Embossing Corp., combines the advantages of beauty, economy, and work-saving convenience with resistance to moisture, fading, stains, and shrinking, and the ability to be wiped clean with a damp sponge and soap. The new shades are being made in wine, forest green, chartreuse, and white, in a variety of shapes, and in six sizes, ranging from 8 to 19 inches to fit all types of lamps.

"Heat Stability, Too, with Vinyls Plasticized with Paraplex G-60." Rohm & Haas Co., Washington Sq., Philadelphia 5, Pa. 4 pages. Information appears on the properties of Paraplex G-60, its compatibility with other materials, and its properties in milled polyvinyl chloride and copolymer stocks. In addition to its plasticizing effect, the material is shown to provide heat and light stability, and to improve the performance of monomeric type plasticizers.

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MALAYA

Rubber and Inflation

For the past two or three months Malayan rubber planting circles have been all agog over the Federal Government's proposals aimed at combating inflation here. Starting from the thesis that the boom in tin and more particularly in rubber lies at the root of local inflationary problems, the Member for Economic Affairs, O. A. Spencer, on May 10 met with the Rubber Producers' Council to consider a government plan for compulsory saving involving the use of the machinery of the existing replanting cess to set aside a much greater share of rubber export earnings than is now done. The money thus kept out of circulation would be placed in a stabilization fund set up by law and invested and administered by trustees or a statutory authority (with a two-thirds majority of representation of the rubber industry) in accordance with government approved regulations. The fund would be used to support the internal price of rubber to the local producers when the world price fell and would cushion any sharp drop in price that might otherwise endanger the solvency of the whole industry; it might also be used to aid replanting schemes and to further research and development work.

These proposals were rejected by the Rubber Producers' Council on the grounds that the present inflation in Malaya is not caused by the rubber industry, except perhaps to the extent that present high wages have resulted in the demand for consumer goods far exceeding the supply; that the proposal for a reserve fund to support the price of rubber when it falls is quite unsound; Malaya produces less than 25% of the world's supply of rubber, both natural and synthetic, and hence to attempt to interfere with the free operation of the law of supply and demand unilaterally might be highly dangerous.

Basically the rubber industry seems to recognize the need of some scheme for creating reserves against price declines and for future replanting. Indeed the majority of the estates have, reportedly, on their own initiative already begun to take their own measures with this same end in view, and they are understandably averse to a government scheme which apparently is to apply indiscriminately to themselves and to smallholders who are said to be spending all they make. Furthermore the government has said nothing about the amount of the proposed cess so far, the term of its enforcement or, how or when it is to be repaid; finally there is a distinct feeling against placing funds with an administration whose free spending is held by many to be a major cause of inflation.

Naturally the government plant has its supporters, and Australia, which has applied a similar system to wool, has been quoted as an example well worth following.

Incidentally the attempt of Sir John Hay to prove that sterling companies, at least, cannot be held responsible for inflation here, by showing as an instance that only one-third of the earnings of a company he directs was spent in Malaya in 1950, backfired when a correspondent in the *Straits Times* recalled that a few years ago when nationalization of rubber was being mooted, Sir John proved that the greater part of the profits from rubber remained in Malaya.

Nationalization of rubber in Malaya has been in the news again. Something of a furore was created by a broadcast over Radio Malaya on July 1 when the station's news editor, talking of the rejection of the stabilization plan by the Rubber Producers' Council, attacked the rubber industry for its greed and exclaimed:

"Other countries have taken over the control of their basic industries; why not Malaya?"

The implied threat of nationalization of rubber, if opposition to the plan persisted, was taken more seriously than at first glance seems to have been warranted. But the broadcast was translated for the benefit of the non-English-speaking population; moreover, as leading papers here emphasize, the Federal Government has frequently used Radio Malaya for "kite flying" so that the utterance must have had some degree of official sanction; in fact, the *Straits Times*[1] editorially announced itself prepared, if necessary, to prove that the broadcast was approved by a very high official.

The Rubber Producers' Council, scheduled to meet July 19, in Kuala Lumpur to discuss the reply given on June 27 by Mr. Spencer to the Council's disclaimer of rubber's responsibility for inflation here, also proposed to consider the implication of the broadcast.

Meanwhile a government spokesman stated in Kuala Lumpur on July 4 that the Federal Government has not been and is not considering nationalization of the rubber industry.

[1] July 6, 1951.

Rubber Trade Notes

Local production of rubber footwear has been much hampered by shortages of fabrics and chemicals so that it has been difficult to meet even home demand. If supplies of these essential materials are not obtained soon, rubber shoe manufacturers may have to close their factories.

The governments of Singapore and Malaya have announced their decision to adhere to the new policy of the British Government to ban exports of rubber to China. Cargoes of rubber which had already left Singapore for China were intercepted and turned back

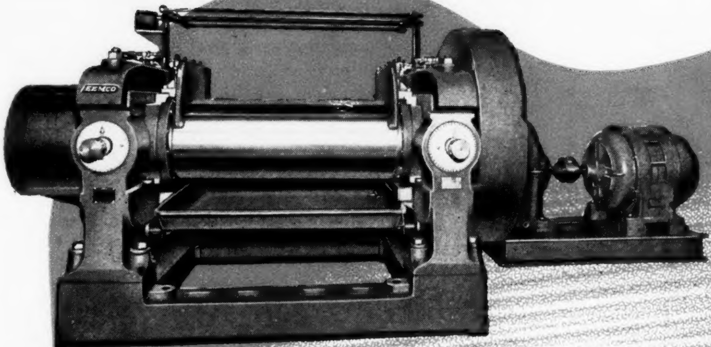
WEST BORNEO

It is almost ten years since it has been possible to obtain reliable details regarding the situation in the rubber industry of what was formerly Dutch West Borneo; but now comes a report[1] of a tour made in those parts last summer by A. P. A. Vink, of the Bogor Experiment Station of the General Association of Experiment Stations, Java.

His itinerary included the stretch from the Port of Pontianak to Sintang, some 350 miles inland. Motor traffic in this part of Borneo, at least, seems practically non-existent; only one very bad automobile road connects Pontianak and Sintang, and the rivers are the chief avenues of transportation and communication; so Dr. Vink made the trip by boat up the Kapuas River.

There are several large enterprises in West Borneo, he reports, which even by Occidental standards would be classed as estates, among them, Soengi Dekan, Batoe Doeland, Serandjam, and Nonga Djetah estates. Exploitation of these plantations is greatly handicapped not only by the lack of adequate means of transportation, but by the shortage of labor. Before the Japanese occupation many Javanese contract workers were employed, but the war scattered these, and labor is now expensive and scarce. The need of extensive mechanization of tasks as weed control, soil cultivation and replanting, and improved transportation is therefore obvious. Most estates suffer a further drawback in that they still have fairly large areas of old seedling rubber; when the average yields from these old areas run from 250 to 500 kilograms per hectare, as compared with 1,000 to

[1] *Bergcultures*, Feb. 1, 1951, p. 47.



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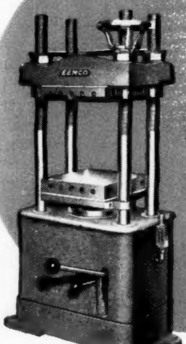

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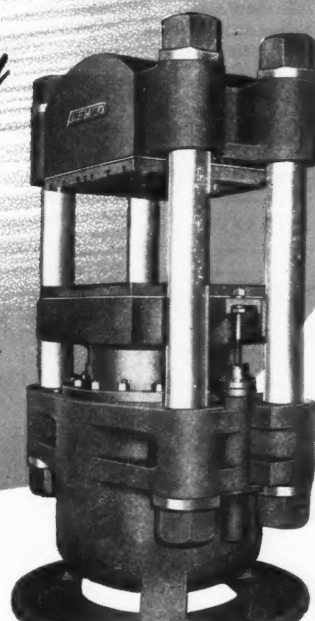

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RUBBER AND PLASTICS MACHINERY DIVISION

1,500 kilograms per hectare from high-yielding material, it is clear that replanting is a necessity.

The rubber industry in West Borneo, of course, is represented chiefly by so-called native rubber, a good deal of which is found along the banks of most rivers here. Everywhere, over practically the entire distance of his trip up the Kapuas, Dr. Vink saw native rubber along both banks, even on boggy land, sometimes in scattered gardens, and then again covering considerable areas in the more elevated districts. The total area of native rubber is put at roughly 170,000 hectares (about 417,000 acres), of which 130,000 hectares (about 318,000 acres) are estimated to be in tapping; the rest is said to be largely untappable. The individual gardens range in size from substantial holdings covering more than 200 hectares (about 500 acres) to small plantings of as few as 60 trees. Average output is figured at 800 kilograms of dry rubber for stands of 600 to 1,000 trees per hectare. The best trees are on the higher grounds; those in the low-lying areas near the mouth of the river are on the whole poor and are also very badly tapped.

Systems and quality of tapping vary considerably, and the frequency of tapping depends on the price of rubber. Last August, Dr. Vink found that many trees were tapped daily and in many cases twice a day; tappers frequently began as early as 3:00 a.m., working by the light of lamps attached to their hats.

Although it is customary to lump all Asiatic undertakings together under the single head "native rubber," suggesting that there is one common level of efficiency, actually very wide differences exist between the way the plantations are run by Chinese, Malays, and Dyaks (the chief racial groups here). The first have the best managed gardens, and they prepare a substantial amount of Standard No. 1 sheet of very good quality. The Dyaks, on the other hand, are content to supply poor slabs and balls of lump and scrap much mixed with twigs, leaves, sand, and stones. The rubber prepared by the Malays practically runs the gamut between these extremes, but consists chiefly of sundried sheets which usually arrive at Pontianak covered with mold.

The off-grades and low grades of rubber are for the most part bought up by Chinese who prepare them for market by suitable treatment.

The author mentions an experiment in cooperative rubber growing and preparation being carried out on some rubber land formerly reserved by the Dutch authorities for tapping tests. This land has been turned over to the Asiatics who work the garden and prepare the rubber in the little factories which had already been established there, on a cooperative basis. The former conductor of the tapping experiments now acts as adviser to the natives.

Dr. Vink brings out very clearly the great influence of the Chinese in West Borneo. They dominate the economy of the territory far more completely than in Java, for instance, where they are also factors to be reckoned with in commerce. Chinese in West Borneo control 99% of the local trade and apparently some participate in a good bit of smuggling on the side, chiefly with adjoining Sarawak and with Singapore. The influence of the Chinese is not surprising, once their business methods are explained. Take the case of native rubber, the trade in which is almost entirely in their hands; they deliver all kinds of consumer goods to the growers, accepting the rubber as payment, and they continue to supply the native with necessities even when rubber is unsalable and they accordingly lose—sometimes quite heavily—by these transactions. No doubt they manage to balance accounts in their favor sooner or later, but in the meantime they have carried their clients during the hard times.

Most of the remilling of native rubber is done in Pontianak by Chinese remillers who apparently deal direct with the growers in the interior. At Liong Hong factory at Pontianak, which Dr. Vink visited, the products handled are: (1) Fairly good sheets (Smoked No. 2) from so-called Chinese districts receive no treatment except more complete drying before being offered for sale. (2) Sundried sheets, covered with mold, are first washed in the river, then smoked, graded, and sold as sheets No. 2, 3, 4, and 5. The company in question operates two smokehouses with capacity of about 3,000 kilograms each. (3 and 4) Smoked and sundried sheet that have become stuck together and cannot be separated, and slab rubber; these are mechanically cut up and worked into blankets. (5) Finally, the dirty lump and scrap rubbers of the Dyaks is allowed to rot in concrete vats and then milled into a kind of compo crepe. In August, 1950, this inferior material was bought for the equivalent of about 8¢ (U. S.) a pound and sold for about 25¢ a pound.

Dr. Vink also visited the clonal seed gardens, Dedajoe, of the Agricultural Advisory Service in the so-called Chinese district North of Pontianak, where he saw plantings of the clones LCB 1320, PR 107, Avros 163, Avros 185, Tjir. 1, BB 5, BR 1, and Tjir. 16. The growth of the first three and also of Tjir. 1 was found to be very good, but that of the rest was less satisfactory.

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For technical information on these and other Monsanto Chemicals for the Rubber Industry, contact MONSANTO CHEMICAL COMPANY, Rubber Service Department, 920 Brown Street, Akron 11, Ohio.

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A-77*
A-100

MERCAPTO ACCELERATORS

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INDONESIA

In March, Sibolga, in Tapanuli, Sumatra, acquired its fourth rubber remilling plant, that erected by Tat Hin Coy, Ltd., an affiliate of an important Chinese trading company with headquarters in Sibolga and branches in Medan (Sumatra), Djakarta and Padang (Java), and Singapore. The new enterprise has reported annual capacity of 5,000 tons, which it is planned shortly to double by the installation of additional equipment, whereby the total productive capacity of the factories in Sibolga would be rais.d to 17,800 tons a year. Actual present production of the Tat Hin Coy plant is 360 tons monthly.

It is understood that four foreign-owned rubber estates in North Sumatra are soon to be returned to their owners. The estates, three of which belong to Sipet-Anglo Dutch and one to Grummit Reid & Co., are said to be in poor condition, with trees for the most part ruthlessly exploited, and factories, in the Tamiang areas, all destroyed.

Chinese play an important part in the manufacture of rubber goods in Indonesia. Of 55 factories now operating, 49 belong to Chinese; three are Indonesian owned; and three, the largest, are under American or European ownership.

In 1950 output of passenger-car and truck tires was at the rate of 200,000 units a year, with an equal number of tubes, all the product of a single company which also makes most of the cycle tires and tubes, total production of which averages 1,600,000 and 1,200,000 units respectively. It is understood that a large Chinese owned factory expects to be able to enter the automobile tire field by the end of the current year.

Other goods manufactured here include technical rubber goods and rubber footwear. Output of the largest local manufacturers of rubber shoes and sandals is estimated at 35,000 pairs weekly; before the war the figure is said to have been 50,000 pairs.

Indonesia imported about 2,400 tons of rubber goods during 1950, for the most part automobile tires, of which the United States supplied about 25% and the United Kingdom about 60%. The United Kindgom also sent most of the imports of belting and manufactures other than tires.

INDIA

The Indian rubber industry is being handicapped by a shortage not only of raw rubber, but also of essential chemicals, recent press reports state. The situation seems particularly difficult with regard to accelerators and activators, which are not manufactured locally, but must be imported. Sulfur, zinc oxide, titanium dioxide, lithopone, rubber pigments, and dispersing agents for the latex industry, all are said to be very scarce.

As a result, manufacturers are trying to modify processes in some cases or have cut production. The Dunlop rubber factory at Shaganji was reported by Reuter to have stopped operations for a month. This is one of the biggest local tire and tube manufacturing enterprises in India and employs about 4,000 persons.

AUSTRALIA

The new tire factory at Brisbane began to operate last December and is said to be producing at the rate of 2,000 units a week. Output is expected to reach 5,000 to 6,000 units a week by the end of the current year.

Reports from Malaya indicate that exports to Australia, normally averaging about 3,000 tons monthly, reached 5,000 tons in April, 1951, and it is expected future shipments will continue at the higher level.

CEYLON

At a meeting in Ceylon to consider the embargo of rubber to China, the Low Country Products Association urged the government not to impose control of distribution on Ceylon rubber exports.

Last year Ceylon exported 265,188,469 pounds of rubber, including 20,415402 pounds of sole crepe, against about 195,000,000 pounds, including 15,439,193 pounds of sole crepe in 1949. Ac-

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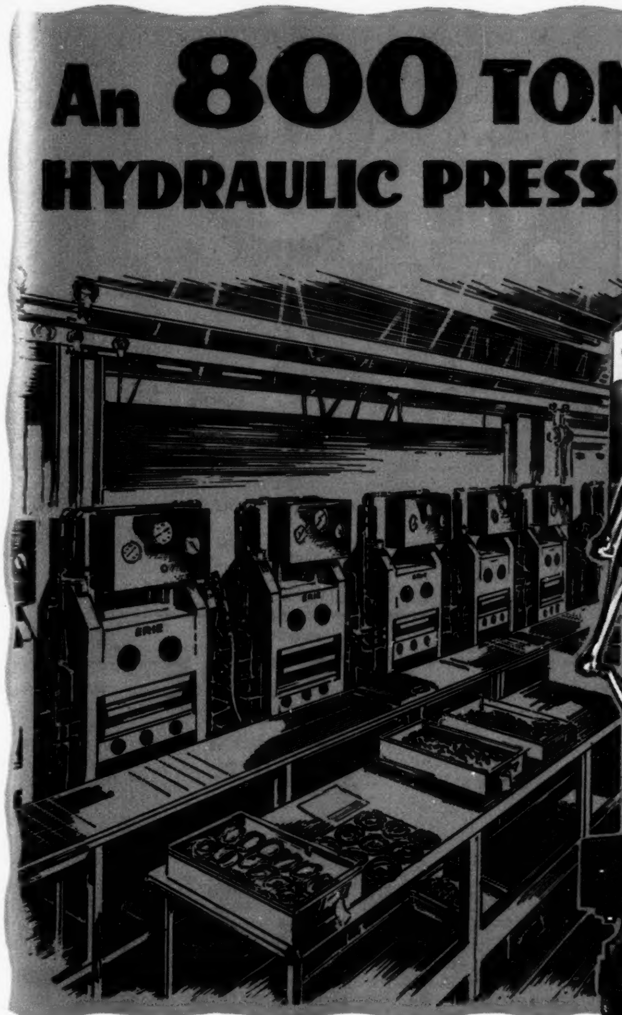

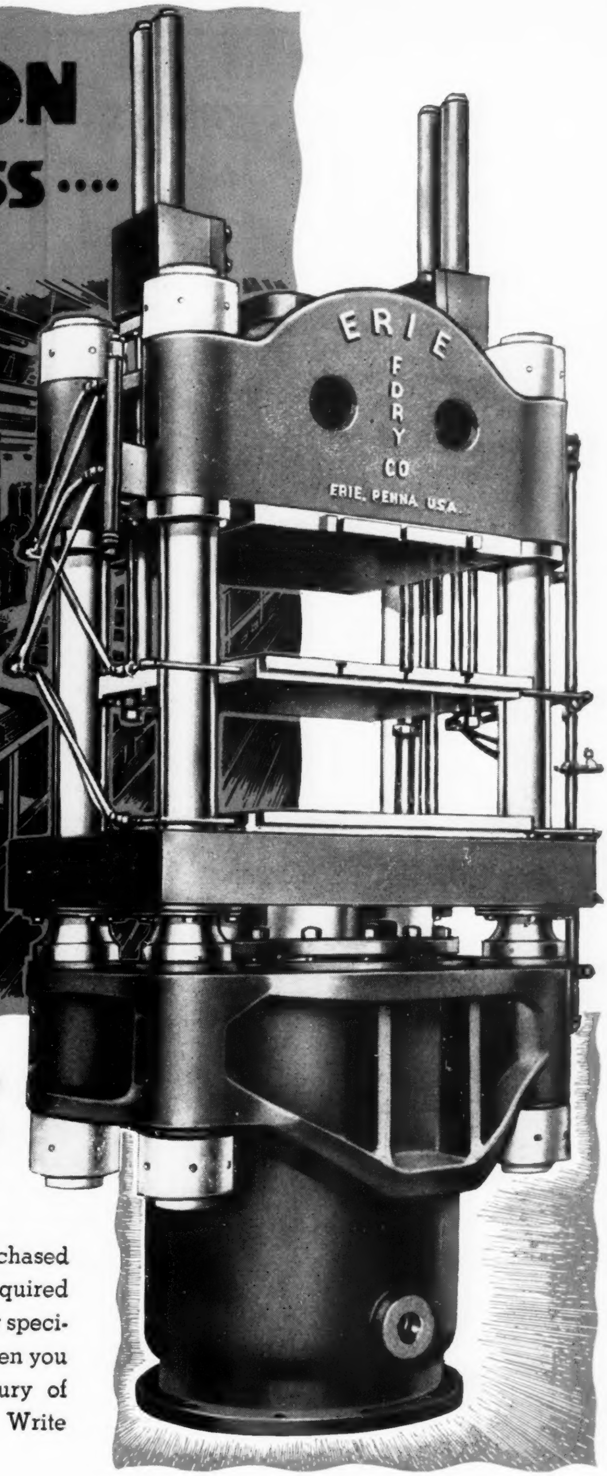

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cording to customs returns, the average value of the rubber was 1.53 rupees a pound, against 0.90-rupee a pound. The annual report for 1950 of the Colombo Rubber Traders' Association points out that during 1950 prices rose to the highest levels since 1912, with RMA crepe No. 1 reaching a peak of 3.65 rupees and Ribbed Smoked Sheet 3.20 rupees a pound.

CHINA

Recent press reports state that the Chinese Communists intend to increase rubber growing on the island of Hainan. Some years ago a small amount of rubber planting had been started there, and it seems to be the plan to extend rubber production, and to this end it will be attempted to recruit experienced Chinese rubber growers from the southeast Asia rubber centers.

Following a different tack, Chinese merchants in Hong Kong are reportedly about to explore the possibilities of obtaining rubber from Ceylon and Indonesia for direct shipment to China. Since Indonesia some time ago intimated that it would not forego trade with Communist China, these efforts may have some success. Burma has also declared herself ready to continue trade with China. Press reports indicate that various goods, including rubber and petroleum, are shortly to be sent to China overland across the northern border of Burma.

EUROPE

FRANCE

Textiles and Rubber

On the occasion of the International Textile Exhibition at Lille, April 28 to May 20, the editors of *Revue Générale du Caoutchouc* took the opportunity of underlining the importance of textiles in the rubber industry in a series of articles in the May, 1951, issue, from which we quote below.

The French rubber industry uses more than 30,000 metric tons of textiles annually, including 10-12,000 tons of cotton yarns, and about the same amount of rayon yarn, for the tire industry, and 8-10,000 tons of fabrics for other branches of the rubber industry.[1]

It is now almost 20 years since belting woven from Filastic, the textile thread impregnated to the core with latex, was first introduced in France and England, and its use has continued to develop until now it is employed in a wide variety of industries. The wood-working and machinery industries were among the first to use Filastic transmission belts. More recently both transmission and conveyer belts of the material have found their way into the textile, chemical, and food industries, also in mines, gas works and central stations for electricity.[2]

In France too, investigations have been carried out on the problem of reinforcing and improving textiles with the aid of "positive latex," and at the Institut Français du Caoutchouc a new latex of this type, Xetal 50, has been produced, which is now being manufactured by S. A. Franterre, Paris. Two forms of the product are available, vulcanized general-purpose Xetal and unvulcanized Xetal specially intended for all gumming and adhesion purposes.

Xetal, 50, which resembles ordinary concentrated latex in appearance, has a D.R.C. of 49-51%; pH 10-11. Its chemical stability is said to be excellent for a pH range of 3 to 11; stability to heat is good up to 60° C., and it can successfully be stored for as long as nine months. Textiles treated with Xetal can be washed, bleached, and dyed, and finished fabrics may be dry cleaned. Not only cotton and wool, but also asbestos and artificial fibers can be treated with the new latex.[3]

Weaving and knitting of rubber thread and a method of warping with constant tension (instead of with constant elongation) are discussed by M. Leblanc.[4]

The problem of improving the union of rubber to cotton has been studied by I. Piccini of the I.F.C., who deals specifically

[1] "Textiles and Rubber." C. Coisne, p. 304.
[2] "Filastic Belting after the Bengrand Process and Latest Applications." J. Dennery, p. 306.
[3] "Xetal 50, Positive Rubber Latex." E. Valtier, p. 309.
[4] P. 313.

with the "Case of Bonding Reinforced Latex and Positive Cotton."[5]

The "reinforced latex" mentioned, recently developed by J. Le Bras at the I. F. C., is a mixture of ordinary concentrated latex and 10% of a soluble resorcin-formaldehyde resin condensed in alkaline medium under very special conditions. It is said to have unusually good abrasion, tearing, and tensile properties. The cotton is rendered positive by immersion into a dilute solution of a new cationic soap of undisclosed composition, marketed as Steramine 790 by Ets. Doittau, Paris. Samples consisting of plies of positive cotton bonded with reinforced latex are claimed to have shown values for resistance to separation averaging 8.0 kg/cm; in certain cases values as high as 10 to 15 kg/cm were obtained. These values compare with 4.0 kg/cm for frictioned cotton and 4.5 kg/cm for ordinary cotton fabrics treated with ordinary latex.

The application of the above method in the manufacture of conveyer belting has been attempted, and details of procedure in the laboratory with laboratory equipment are next given.[6] The method is expected to permit a continuous process of manufacture eventually, and it is planned to construct a model of a continuous machine to demonstrate this on a very small scale.

An element of the belting produced in the new process has been connected to a conveyer belt in actual use, and it is hoped in this way to be able to obtain practical data permitting a comparison of the reinforced latex rubber with the classical rubbers containing high reinforcing carbon blacks.

S. A. Franterre, Paris, has just put on the market, under the name of "Vulcafran," 60% prevulcanized latex prepared without any heating whatever, by a process avoiding the preliminary incorporation of stabilizing soaps capable of initiating fermentation on storage, thereby insuring very homogeneous vulcanization. It is claimed that perfectly transparent and perfectly pure articles can be made having mechanical properties distinctly superior to anything obtainable with the usual prevulcanized latices on the market. Vulcafran is said to have a rapid drying and curing rate that makes it very suitable for dipping, flow casting, and molding processes. The product is recommended especially for surgical and sanitary goods, elastic thread, objects with high dielectric properties, for use in the textile industry (for proofing and impregnation), and for bonding fibers in the production of imitation leathers and special papers.

[5] P. 317.
[6] "Reinforced Latex Rubber and the Manufacture of Conveyer Belts." C. Pinazzi, I. Piccini, p. 321.

Belgian Congo

(Continued from page 608)

Following the example of the Far East, the local government began to encourage natives to plant rubber in 1939. A census in 1950 established that the native-owned area of economically exploitable plantation rubber is 15,500 hectares.[1] At present only about 400 hectares are in tapping, but another 900 hectares will be ready to produce shortly. Since more than half the 15,500 hectares was planted with unselected seed during the war (apparently improved material was not available), yields of 420 kilograms per hectare in the second tapping year are considered satisfactory, and it is expected that when fully mature, the native area will give an overall yield of 600 to 700 kilograms per hectare and contribute an additional annual output of 9,000 to 10,000 tons to the colony's total.

On the whole the government is said to be pleased with developments in native rubber; most of the owners seem to take pride in their holdings and care for them properly, and their skill in tapping is improving; closely planted areas, which constitute about half the total, have—against all expectations—proved singularly free from root disease; finally it has been observed that where native holdings are in tapping, improvement in local trade quickly follows, since natives with money to spend soon discover new needs. *Hevea* planting thus offers a solution to economic problems, especially in remote parts. The present level of prices resulting from the United States demand for rubber for stockpiling is largely responsible also for native interest in rubber growing, and it is hoped that the appeal of this easy-to-produce crop will be sufficient to keep the inhabitants on the land and thus stem the heavy exodus to the cities.

At present about three-fourths of the output of Belgian Congo rubber goes to Belgium, which, however, must still get most of her natural rubber supplies from Malaya and Ceylon.

[1] One hectare equals 2.45 acres.

Editor's Book Table

BOOK REVIEWS

"An Introduction to the Chemistry of the Silicones." Second Edition. Eugene G. Rochow. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Cloth, 6 by 9 inches, 227 pages. Price, $5.

This second edition shows extensive revision over the first book published in 1946. In addition to modernization, the treatment has been further extended in the fundamental and theoretical aspects of silicones and includes much material formerly under wartime or patent restrictions. More than 80 pages have been added, and new chapters are now included on the carbon-silicon bond, synthesis of organosilicon compounds, the physical chemistry of silicones, and tables of properties of organosilicon compounds. Other chapters which have been retained and brought up to date include: simple covalent compounds of silicon; organosilicon monomers; types of organosilicon polymers; properties of the specific silicone polymers; water-repellent films and protective coatings from organosilicon materials; some production considerations; and analytical methods. Author and subject indices are appended to the book, and many literature references are given in the text. The chapter on specific polymers includes discussions of silicone rubber, "bouncing putty," and various silicone resins.

"Science French Course." C. W. Paget Moffatt. Revised by Noel Corcoran. Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Cloth, 4¾ by 7¼ inches, 340 pages. Price, $4.75.

This book, a self-teaching manual on scientific French, is designed to provide students with the necessary minimum of grammar and a selection of extracts for preliminary practice. The subject matter is divided into five parts, with a concise and well-organized discussion of grammar comprising the first part. More advanced information on grammatical irregularities is given in the next two parts. The fourth part consists of simple articles read in conjunction with the section on grammar; while the concluding part consists of many technical articles and summaries taken from recent literature on every important branch of science. A detailed alphabetic vocabulary list eliminates the need of a dictionary, and a list of proper names, a general index, and an index of French words and suffixes aid in the rapid assimilation by the reader of sufficient French to be able to read and understand technical material within a short time.

NEW PUBLICATIONS

"Driers, Stabilizers, Plasticizers, Paint Specialties, Tackifiers, Wood Preservatives, Emulsifiers." Advance Solvents & Chemical Corp., 245 Fifth Ave., New York 16, N. Y. 4 pages. This handy reference chart shows specifications, applications formulations, and other laboratory data on the company's products.

"Taylor Technology." Centennial Issue. Vol. 3, No. 4; Spring, 1951. Taylor Instrument Cos., 95 Ames St., Rochester 1, N. Y. 40 pages. This issue of the Taylor house organ commemorates the company's one hundredth anniversary. Stories and illustrations review the company's history and growth, current facilities and activities, and compare its early and modern-day products for home and industry.

"Flexamine, A Superflexing Antioxidant." Compounding Research Report No. 15. Naugatuck Chemical Division, United States Rubber Co., Rockefeller Center, New York 20, N. Y. 12 pages. A revision of Compounding Research Report No. 4 previously issued, this bulletin discusses the properties, compounding, and uses of Flexamine. Comparative laboratory test data are given on flex cracking resistance obtained in heavy-service truck tread, wire insulation, shoe soling, and belt stocks.

Bulletins of Goodyear Tire & Rubber Co., Inc., Akron 16, O. "**Wing-Stay S in GR-S Rubber.**" Techni-Guide WS-100-3. 4 pages. Data compare Wing-Stay S with other antioxidants in white GR-S stocks. "**Wing-Stay S in Shoe Sole Compounds.**" Techni-Guide WS-100-4. 4 pages. Comparative data are presented on Wing-Stay S in shoe sole compounds based on GR-S, GR-S-26, and GR-S-50.

"**Ferro Stabilizer Handbook.**" Ferro Chemical Corp., Bedford. O. 38 pages. This revised and up-to-date edition of this handbook discusses practical aspects of vinyl stabilization; describes optimum stabilizer combinations; gives detailed product data on the company's 13 stabilizers; includes copies of two recent technical bulletins issued by the company; and lists Ferro sales agents.

"**Engineering Standards for Multiple V-Belt Drives.**" The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York 22, N. Y., and the Multiple V-Belt Drive Association, 7 W. Madison St., Chicago 2, Ill. 16 pages. Price, 50¢. This standard provides dimensional and other design and engineering data on V-belts, belt sheaves, and multiple belt drives.

"**Dirt Content of Crude *Hevea* Rubber.**" K. F. Heinisch and G. J. van der Bie, Indonesian Institute for Rubber Research, Bogor, Java.

"**I. Determination of Dirt Content.**" No. 4/51. 11 pages. After a short general survey of the present methods used for dirt in rubber, an improved gravimetric method is described, which was found suitable for routine determinations. A distinction is made between the "insoluble" portion, which is termed "absolute" or "total" dirt, and the "harmful" dirt; the latter is classified as the mechanical impurity which is retained on a 325-mesh screen.

"**II. Average Dirt Content of Trade Grades.**" No. 7/51. 14 pages. Illustrated. A survey of the dirt content in various trade grades of crude rubber shows that there is little relation, on the whole, between dirt content and the trade grades of rubber. Rubber produced under the greatest of care is free from harmful dirt, but contains from 0.15 to 0.40% total dirt, which is made up of natural constituents of the latex. The harmful dirt content in the better grades of rubber averages about 0.10% and is more than 0.5% in some of the lower grades. The dirt in the lower grades is generally of a much coarser structure.

"**IV. Influence of Packing and Bale Coating.**" No. 10/51. 7 pages. Smoked sheet as a wrapping material absorbs dirt particles more readily than crepe or blankets, and it is easier to brush off (either wet or dry) dirt particles from crepe than from smoked sheet. Cloth wrappings result in absorption of great amounts of fibers which are difficult to remove from the rubber. Bale coatings not only prevent bales from sticking to each other, but also protect the bales from absorbing dirt and aid in their cleaning.

"HSC #13 Oil." Bulletin #07-42-0-3-51. Harwick Standard Chemical Co., 60 S. Seiberling St., Akron 5, O. 5 pages. Information is given on the use of HSC #13 Oil as an aid in the mixing and pigment dispersion of highly loaded rubber stocks. Applications are illustrated by the inclusion of typical formulations for shoe sole stocks with their properties.

"Cabot Carbon Blacks for All Purposes." Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass. 1 page. This colorful chart consists of a printed sheet laminated between two layers of transparent plastic and shows the company's carbon blacks for rubber, inks, paints, paper, plastics, and special uses. Blacks are shown according to their particle size, and variations in properties resulting from particle size are indicated.

"Rubber and Synthetic Rubber Compounds. ASTM D735 and SAE Standard R-10." BL-242, June 30, 1951. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 32 pages. This report gives recommended natural rubber, GR-S, and neoprene formulations to meet the Types R and S, Class SC requirements of ASTM D735-51T and SAE Standard R-10 covering rubber compounds for automotive and aeronautical applications. Physical properties of the formulations are also included in comparison with the requirements of the standards, and many of the recommended formulations are applicable to Military Specification MIL-3065.

"Geon Resin 404." Service Bulletin G-6. B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, O. 12 pages. Laboratory test data cover the physical, chemical, and electrical properties of Geon Resin 404, an unplasticized rigid vinyl. Processing and compounding methods are discussed, and suggested starting recipes appear for various types of compounds.

"Review of Current Research and Directory of Member Institutions, 1951." Engineering College Research Council, American Society for Engineering Education, 77 Massachusetts Ave., Cambridge 39, Mass. Paper, 254 pages. Price, $2.25. This directory outlines more than 5,200 engineering research projects, including work on rubbers and plastics, now active in the 91 colleges and universities holding membership in the Council. In addition, there are given for each school the names of the research administrative officers, a summary of policies governing research projects and contracts, the number of research personnel, annual research expenditures, and special courses and conferences of interest to research workers. A complete index of research project subjects, including more than 4,000 entries, facilitates use of the book.

"How Increasing Your Steam Costs Can Save Money." Booklet No. 2171. Sarco Co., Inc., Empire State Bldg., New York 1, N. Y. 6 pages. This booklet consists of 16 questions and answers providing helpful information on the efficient use of steam.

"Bi-Monthly Supplement to All Lists of Inspected Appliances, Equipment, Materials." April, 1951. Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago 11, Ill. 96 pages. **"Books and Periodicals,** Catalog 1951." Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. 68 pages. **"The Strange Case of the Seven-Sided Post Hole."** American Standards Association, Inc., 70 E. 45th St., New York 17, N. Y. 40 pages. **"Motor Trucks and National Defense."** Automobile Manufacturers Association, New Center Bldg., Detroit, Mich. 20 pages.

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MARKET REVIEWS

CRUDE RUBBER

THE big development in the crude rubber market was the announcement June 21 by GSA that its selling prices for natural rubber would be reduced on July 1, and that the lower prices would remain in effect through September 30. No. 1 sheets were cut from the previous price of 66¢ a pound to 52¢, and the other grades were reduced correspondingly. The new price list for natural rubber grades sold by GSA follows:

	¢/Lb.
No. 1X R. S. S.	52
1 R. S. S.	52
2 R. S. S.	51 1/4
3 R. S. S.	50 1/2
4 R. S. S.	48 1/2
5 R. S. S.	44
Air-dried rubber sheets	53
No. 1X Thin Pale Crepe	60
1 Thin Pale Crepe	59
2 Thin Pale Crepe	56
3 Thin Pale Crepe	53
1X Thick Pale Crepe	60
1 Thick Pale Crepe	59
2 Thick Pale Crepe	56
3 Thick Pale Crepe	53
Liberian A	54
Liberian Select A	55
No. 1X Brown Crepe	47
2X Brown Crepe	44 1/2
3X Brown Crepe	40
1 Brown	42
2 Brown	41
3 Brown	40
4 Brown	38
1 Smoked Blanket	42
2 Smoked Blanket	40
Type 20 Smoked Blanket	42
Flat Bark	29
Beni Bolivian	45
Upriver Fine Para	43
Liquid Latex	64

The price reductions had a bearish effect on foreign primary markets where prices dropped to corresponding levels. Further declines on the Singapore markets were noted later in the period from June 16 to July 15, as a result of desultory government purchases and the expectation that last-quarter GSA selling prices would be further reduced.

The price reductions also had the immediate effect of eliminating factory purchases of crude rubber from the GSA during the second half of June while factories were waiting for the new prices to take effect. Even during July purchases were reported to be only moderate in volume in view of the vacation period and the establishment of a guaranteed price through September.

Effective July 1, ORR changed the billing procedure on purchases of government-made synthetic rubber to require payment within 30 days after the rubber has been shipped. The previous system required payment in advance, and many manufacturers, particularly the smaller ones, were strained by making such advance payments for rubber that was often weeks late in delivery.

Latices

AS IN the case of crude rubber, the big news in the latex market during the period from June 16 to July 15 was the reduction in the GSA selling price for *Hevea* latex from 84.5¢ to 64¢ a pound solids, effective July 1. In view of the annual plant vacation period, the effect of the lower price on latex product sales was not immediately evident, but will undoubtedly serve to stimulate consumption. According to Arthur Nolan, Latex & Rubber, Inc., writing in the July issue of *Natural Rubber News*, retail business on latex items has been very slow in recent months, and inventories of latex products are still quite high. The new price should alleviate to some extent the condition where many latex products were priced out of the market.

April receipts of *Hevea* latex were 5,850 long tons, dry weight; consumption, 3,977 long tons; and month-end stocks, exclusive of government stocks, 5,862 long tons. Preliminary estimates for May show receipts of 4,500 long tons, dry weight; consumption, 3,500 long tons; and industry month-end stocks, 7,000 long tons.

Estimated production of GR-S latex for May and June are 2,500 long tons, dry weight, for each month. Bulk GR-S latex prices continue unchanged at 24.5-26.25¢ a pound solids, plus a 1¢ a pound uniform freight charge. Production of cold GR-S latex Type X-547 is at a level of approximately 250,000 pounds a month, but demand is far in excess of this quantity. Present production of all GR-S latices amounts to 2,500-2,700 tons a month, and facilities for conversion to cold latex production are being provided. The same converted facilities could also produce cold rubber, and there is some question whether they will be used for latex or dry rubber.

RECLAIMED RUBBER

NO NEW developments occurred in the reclaimed rubber market picture from June 16 to July 15. Production and sales of reclaim continued at high levels throughout the period. The expected ceiling price regulation on reclaim did not appear, and the future of such a regulation is uncertain in view of current Congressional action on the entire pricing picture.

Final April and preliminary May statistics on the domestic reclaimed rubber industry are now available. Final April figures give a production of 34,293 long tons; imports, 18 long tons; consumption, 32,428 long tons; exports, 1,398 long tons; and month-end stocks, 39,064 long tons. Preliminary figures for May indicate a production of 34,866 long tons; consumption, 34,207 long tons; exports, 1,512 long tons; and month-end stocks, 38,628 tons.

No changes were made in reclaimed rubber prices during the period, and current quotations follow:

Reclaimed Rubber Prices

	Sp. Gr.	¢ per Lb.
Whole tire	1.18-1.20	10.00/10.75
Peel	1.18-1.20	nom.
Inner tube		
Black	1.20-1.22	nom.
Red	1.20-1.22	nom.
GR-S	1.18-1.20	nom.
Butyl	1.16-1.18	nom.

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

SCRAP RUBBER

THE scrap rubber market was quiet during the period from June 16 to July 15. Demand for scrap from reclaimers was said to be non-existent in view of the large scrap inventories at the mills and the approaching vacation period. The lack of demand for scrap was reflected in easier prices for all grades except red passenger tubes, which held at previous levels. The immediate outlook for scrap is not too promising, although the long-range view envisages a continuing demand for reclaim with resultant need of scrap rubber by the mills.

With few domestic outlets, scrap dealers have been eying the export market. While interest from abroad is evident, and inquiries are being made, foreign buyers are limited by a lack of dollars, so actual orders are said to be few in number. Most interest is being displayed by Japan, which was the largest single purchaser of scrap rubber from the United States during the first quarter of this year. Other large buyers include Spain, France, and Germany, and smaller purchases have been made by Canada, Mexico, Belgium, Portugal, Cuba, Pakistan, Venezuela, and Bolivia.

Following are dealers' selling prices for scrap rubber, in carload lots, delivered to mills at the points indicated:

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$27.00	$27.50
Peelings, No. 1	67.50	67.50
3	32.00	32.00
	(¢ per Lb.)	
Black inner tubes	10.00	10.00
Red passenger tubes	17.00	17.00

COTTON AND FABRICS

New York Cotton Exchange
Week-End Closing Prices

Futures	Apr. 28	May 26	June 23	June 30	July 7	July 14
Oct.	40.16	38.02	36.96	36.06	36.13	35.33
Dec.	39.69	37.67	36.76	35.76	35.85	35.18
Mar.	39.58	37.59	36.83	35.80	35.93	35.22
May	39.22	37.46	36.68	35.72	35.78	35.13
July	38.97	36.97	36.33	35.37	35.47	34.83
Oct.	37.00	34.92	34.61	33.80	33.93	33.20

IRREGULARLY falling prices featured the New York Cotton Exchange during the period from June 16 to July 15. The major factor behind this decline was the prospect of a crop meeting government production goals, but the inactive cotton textile markets also had a bearish effect on cotton prices.

The United States Department of Agriculture estimated cotton cultivation on July 1 at 29,510,000 acres, as compared with 18,613,000 acres for the small 1950 crop. At last year's average yield to the acre, the new crop would be about 16,500,000 bales of cotton, with 500 pounds to a bale. This estimated crop would be in excess of the government goal of 16,000,000 bales and can be compared with last year's 10,012,000 bales.

The spot price for 15/16-inch middling cotton, which had held at the ceiling of 46.06¢ since the imposition of controls and the reopening of the markets on March 8, finally broke on July 6 and fell to 42.17¢ on July 13. October futures began the period at 37.44¢, fell to 36.06¢ on June 29, dropped to a low of 34.97¢ on July 11, and then recovered somewhat to end the period at 35.33¢.

Fabrics

Cotton industrial goods, particularly the wide goods, encountered very slow trading during the period from June 16 to July 15. The lack of activity resulted in production curtailments by several mills, with some cutting down to a four-day, two-shift working week. The heavier goods, such as numbered and army ducks, chafers, and hose and belting ducks were still in good demand, mainly as a result of DO or direct government orders.

Most customers have ample inventories to carry them through the present unsettled period and are awaiting developments on such factors as the Korean peace talks, raw cotton prices, and Congressional action on defense legislation, before making any further commitments for goods. Probably the greatest interest, both domestic and for export, was shown in cotton tire cords. Most cord mills, booked solidly through the third quarter, are reluctant to make any sales into the fourth quarter. The tight-supply situation in both rayon and cotton tire cords has been made even more acute by the curtailments in production abroad, and domestic cords are being sent by American manufacturers to supply their overseas tire factories.

Cotton Fabrics

Drills			
59-inch 1.85-yd.	yd.	$0.475	/ $0.49
2.25-yd.		.405	/ .42
Ducks			
38-inch 1.78-yd. S. F.	yd.	.48 7/8	/ .50 5/8
2.00-yd. D. F.	yd.	.445	/ .46
51.5-inch, 1.35-yd. S. F.		.645	/ .66 5/8
Hose and belting		.82	
Osnaburgs			
40-inch 2.11 yd.	yd.	.36	/
3.65-yd.	yd.	.23	
Raincoat Fabrics			
Print cloth, 38½-inch, 64x60		.1675	
Sheeting, 48-inch, 4.17 yd.		.26 7/8	/ .27 3/4
52-inch 3.85-yd.		.29 1/8	/ .29 3/8
Chafer Fabrics			
14-oz./sq. yd. Pl.	lb.	.84	/ .865
11.65-oz./sq. yd. S		.78	/ .80
10.80-oz./sq. yd. S.		.8175	/ .84
8.9-oz./sq. yd. S.		.83	/ .855
Other Fabrics			
Headlining, 58-inch 1.35-yd., 2-ply	yd.	.62	
64-inch, 1.25-yd. 2-ply		.725	/ .74
Sateens, 53-inch 1.32-yd.		.71	/ .73
58-inch 1.21-yd.		.775	/ .79½
Tire Cords			
K. P. std., 12-3-3	lb.	nom.	
12-4-2		.91	

RAYON

SHIPMENTS by United States rayon producers to domestic consumers during June totaled 107,900,000 pounds, 3% below the May level. Shipments for the first half of 1951 amounted to 643,300,000 pounds, 7% above the figure for the corresponding period in 1950. Rayon filament yarn shipments in June totaled 82,000,000 pounds, equaling the May level. Of this total, viscose high-tenacity yarn comprised 26,600,000 pounds, 2% above the May level. End-of-June stocks of viscose and cupra yarn amounted to 8,900,000 pounds.

No changes appeared in rayon tire yarn and fabric prices during the period from June 16 to July 15, and current prices follow:

Rayon Prices

Tire Yarns		
1100/480	$0.62/	0.63
1100/490		.62
1150/490		.62
1650/720	.61/	.62
1650/980		.61
1900/980		.61
2200/960		.61
2200/980		.60
4400/2934		.63
Tire Fabrics		
1100/490/2		.72
1650/980/2	.695/	.73
2200/980/2		.685

Foreign Trade Opportunities

The firms and industries listed below recently expressed their interests in buying in the United States or in United States representations. Additional information concerning each import or export opportunity, including a World Trade Directory Report, is available to qualified United States firms and may be obtained upon inquiry from the Commercial Intelligence Unit of the United States Department of Commerce, Washington, D. C., or through its field offices, for $1 each. Interested United States companies should correspond directly with the concerns listed concerning any projected business arrangements.

Export Opportunities

May Co., Ltd., 2a Calle N.E. No. 603, Managua, Nicaragua: tires, batteries.

Chr. Fahrner, Fredericksholmes Kanal 2, Copenhagen, Denmark: raw materials, chemicals, and machinery for the rubber industry.

Chr. Petersen, Haderslevgade 26, Copenhagen V, Denmark: passenger-car tires.

Hygenic Flooring Co., N. V., 198 Kroonstraat, Borgerhout, Antwerp, Belgium: rubber flooring, plastic flooring.

N. V. Schulhof, Munro & Co., Ltd., 36 Djalan Sarkara (P. O. Box 164), Surabaya, Indonesia: automotive accessories.

Kokusai Bussan Co., Ltd., 36, 3-Chome Awajimachi, Higashiku, Osaka, Japan: machine for processing eyelets in rubber shoes.

Shoko Trading Co., Ltd., 15-1, 1-Chome, Dojima, Hamatori, Kita-ku, Osaka, Japan: industrial chemicals, crude rubber.

Tominga & Co., Ltd., 2-Chome, Bingomachi, Osaka, Japan: synthetic organic resins, including polyethylene, polystyrene, polyvinyl butyral, and silicone resin.

Taiyo Commercial Co., Ltd., 11, Kajicho, 1-Chome, Kanda, Tokyo, Japan: polyvinyl chloride, polystyrol, synthetic rubber.

Standard Auto Supply, 41 McNab St. N., Hamilton, Ont., Canada: automotive parts, supplies, and accessories.

George Blunn & Co., Ltd., 120 Mountbatten Rd., Kuala Lumpur, Federation of Malaya: zinc oxide for the rubber manufacturing trade.

Ditta Pietro Villani, 20 Via Grotte Bianche, Catania, Italy: sanitary articles.

Fuad Lababidi, Homs, Syria: automobile and truck tires and tubes.

Comptoir Elbe, 35 Rue de Rotterdam, Antwerp, Belgium: soft rubber make-up sponges, combs.

Karekine Yeghiayan, Bustan Gulab, Aleppo, Syria: tires and tubes.

W. O. Heimann, representing Transafrican Indent (Pty.) Ltd., 506-509 Pan-Africa House, Troye St., Johannesburg, Union of South Africa: cotton duck, rainwear fabrics, plastic belting, elastic fabrics.

R. Argillos, 30 Place Gambetta, Bordeaux (Gironde), France: rubberized cloth, hospital equipment, and allied products.

John M. Wright, P. O. Box 2479, Capetown, Union of South Africa: automotive accessories.

Industrial Appliances (Pty.) Ltd., 167 Marshall St., Johannesburg, Union of South Africa: machinery for plastic molding, plastic molding raw materials.

Tehranshahr Co., Ltd., Khiaban Saadi, Tehran, Iran: automobile tires.

Adolfo Cossio Cebrian, San Nicolas, No. 157, Habana, Cuba: rubber articles.

Karekine Yeghiayan, Bustan Gulab, Andol Garage, Aleppo, Syria: automobile tires and tubes.

Anwar Battikhah, No. 111, Bustan Gulab, Aleppo, Syria: tires and tubes.

Import Opportunities

AB Industrius, St. Nygatan 35, Malmö, Sweden: wood flour for plastic and rubber manufacturers.

The Burma Mines & Timber Co., 168 Boundary Rd., Rangoon, Burma: raw rubber.

Hackethal-Draht & Kabel-Werke, A.G., 69 Stader Landstrasse, Hanover, Germany: insulated wires and cables.

Ferdix Rubber (London), Ltd., 104 St. Katharine's Way, London, E. 1, England: waste rubber.

Vinyl-Fiber A/S, P. O. Box 22, Drammen, Norway: rubber impregnated saturating paper.

Wilhelm Kehrenberg, Jr., 19a Eichenstr., Wuppertal-Barmen, Germany: elastic webbing.

Chuo Sangio Co., 15 Higashinocho Enokojima, Nishiku, Osaka, Japan: rubber bands, rubber latex thread, rubber garters, insulating tapes, bicycle tires, tubes, and parts.

Ishioka Trading Co., 165 Iwasakicho, Hodogaya-ku, Yokohama, Japan: rubber goods, automobile and bicycle parts.

C. W. Mackie & Co., Ltd., 7A Prince St., Colombo, Ceylon: surgeons' rubber gloves.

S. Vishtak, Box 307, Tokyo Central Post Office, Tokyo, Japan: miscellaneous rubber goods.

Solomon Latner, representing D. Zigmond, Ltd., Collingdon Rd., West Dock, Cardiff, Wales: waste rubber.

John A. Grey, c/o Constitutional Club, London, W.C.2, England: electric cables.

Korrekta-Werke G.m.b.H., Bad Wildungen, Germany: foam rubber articles.

Eugen J. Schiebold, 14 Karolinen Strasse, Ansbach, Bavaria, Germany: rubber-covered and patterned rolls for printing wallpaper and other fancy papers.

Confectiebedrijf M. M. Grinszpan, 31 Keizersgracht, Amsterdam, Netherlands: rain clothing and fabrics therefor.

United States Rubber Statistics—April, 1951

(All Figures in Long Tons, Dry Weight)

	New Supply			Distribution		Month-End
	Production	Imports	Total	Consumption	Exports	Stocks
Natural rubber, total	0	48,931	48,931	35,610	185	66,158
Latex, total	0	5,850	5,850	3,898	0	5,521
Rubber and latex, total	0	54,781	54,781	39,508	185	71,679
Synthetic rubbers, total	*59,945 †6,469	1,148	67,562	58,787	554	65,793
GR-S types‡	*54,085 †27	949	55,061	48,034	4	49,606
Butyl	*5,860	199	6,059	5,688	0	7,806
Neoprene‡	†5,015	0	5,015	3,972	429	5,379
Nitrile types‡	†1,427	0	1,427	1,093	121	3,002
Natural rubber and latex, and synthetic rubbers, total	66,414	55,929	122,343	98,295	739	137,472
Reclaimed rubber, total	34,293	18	34,311	32,428	1,398	39,064
GRAND TOTALS	100,707	55,947	156,654	130,723	2,137	176,536

*Government plant production.
†Private plant production.
‡Includes latices.
SOURCE: Rubber Division, NPA, United States Department of Commerce, Washington, D. C.

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

Effective July 1, 1947

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.25 per line (ten words)	Light face type 40c per line (ten words)	Light face type $1.00 per line (ten words)
Bold face type $1.60 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.40 per line (eight words)

Allow nine words for keyed address.

Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.

Letter replies forwarded without charge, but no packages or samples.

SITUATIONS WANTED

RUBBER CHEMIST—AKRON, O., AREA. PART-TIME OR CONSULTANT work. Experienced in compounding; lab, factory management; production development; small, large plants. Address Box No. 834, care of INDIA RUBBER WORLD.

CHEMIST: 10 YEARS' WIDE EXPERIENCE IN PRODUCT DEVELOPMENT, application research and technical sales service, primarily in adhesives, coatings, foam sponge, saturants and similar compositions made from latices, resins and dispersions, natural or synthetic. Capable of independent work. Desire position in related field with company not satisfied with things as they are. Address Box No. 835, care of INDIA RUBBER WORLD.

RUBBER CHEMIST WITH ELEVEN YEARS' EXPERIENCE IN tires, tubes, and mechanical goods including compounding, technical service, laboratory, production, and process. Age 33, family, graduate. Address Box No. 836, care of INDIA RUBBER WORLD.

RUBBER CHEMIST DESIRES TECHNICAL SALES POSITION in the rubber chemical and allied fields. Ten years' compounding and laboratory. Age 33, graduate. Address Box No. 837, care of INDIA RUBBER WORLD.

ENGINEER WITH 21 YEARS' EXPERIENCE IN RUBBER, PLASTIC, and foam rubber available September 10, 1951. Address Box No. 838, care of INDIA RUBBER WORLD.

RUBBER CHEMIST EXPERIENCED IN RUBBER FOOTWEAR, compounding, research, and manufacture. Thirteen years' experience. College degree. Married. Address Box No. 852, care of INDIA RUBBER WORLD.

CHEMIST — COMPOUNDER — DEVELOPMENT ENGINEER — 14 years' experience on tires—6 years on mechanicals—molded goods—floor tile—rolls—coated fabrics—and many other products. Address Box No. 846, care of INDIA RUBBER WORLD.

RUBBER CHEMIST WITH OVER TWENTY YEARS OF EXPERIENCE in laboratory, factory, and management in several branches of the rubber industry manufacturing a variety of rubber products seeks a position in the industry. Address Box No. 853, care of INDIA RUBBER WORLD.

SITUATIONS OPEN

RUBBER TECHNOLOGIST, BY NATIONAL ORGANIZATION, must have broad rubber experience and be capable of directing technical service laboratory. Experience in factory compounding and processing desirable. Salary commensurate with experience and ability. Our employes know of this advertisement. Address Box No. 839, care of INDIA RUBBER WORLD.

SITUATIONS OPEN (Continued)

RUBBER CHEMIST, EXPERIENCED IN FACTORY COMPOUNDING and control. Knowledge of hard rubber compounding and processing helpful. Must have supervisory ability. Permanent position with well-financed national organization. Our employes know of this advertisement. Salary is open. Address Box No. 840, care of INDIA RUBBER WORLD.

SUPERINTENDENT WANTED FOR SMALL SHOE SOLING factory; knowledge of rubber machinery. Write stating qualifications, etc. Address Box No. 841, care of INDIA RUBBER WORLD.

LATEX DIPPING

Excellent opportunity, in South American country, for man with thorough experience in all latex dipped products: compounding experience desirable, but not essential. Address Box No. 845, care of INDIA RUBBER WORLD.

ADHESIVE CHEMIST—MUST HAVE WIDE GENERAL EXPERIENCE, latex and solvent adhesives, backing compounds, flocking cements and specialties; able to take complete charge of laboratory, moderate sized eastern company. Reply stating schooling, experience, starting salary. All replies held in strict confidence. Address Box No. 847, care of INDIA RUBBER WORLD.

SPONGE RUBBER CHEMIST—EXCELLENT OPPORTUNITY FOR man with experience and ambition. Permanent position with established firm in Pennsylvania. Salary open. Submit detailed resume of business experience and personal qualifications first letter. Address Box No. 848, care of INDIA RUBBER WORLD.

RUBBER CHEMIST WITH EXPERIENCE IN DEVELOPMENT and production of solvent resistant synthetics. Plant ideally located in Pennsylvania. In replying give age, educational background, experience, salary requirements, and how soon available. Address Box No. 849, care of INDIA RUBBER WORLD.

RUBBER CHEMIST EXPERIENCED IN GENERAL LINE OF natural and synthetic latex compounds. Available for field work. Excellent salary with future. State qualifications in first letter giving experience and technical background. Sales ability would be asset. Address Box No. 854, care of INDIA RUBBER WORLD.

PRODUCTION AND DEVELOPMENT, CHEMIST FAMILIAR with mixing and formulations of vinyls for extrusion. Nylon experience also desired, but not required. Long-established and progressive New England firm. Letter giving full details requested. Address Box No. 850, care of INDIA RUBBER WORLD.

DENVER, COLORADO, RUBBER MANUFACTURER OFFERS excellent opportunity for graduate engineer experienced in camelback, airbags, and tire repair materials; also needs administrative ability. Occasional technical service trips. Excellent opportunity for advancement. Address your letter stating age and outlining qualifications to Box No. 855, care of INDIA RUBBER WORLD.

(Classified Advertisements Continued on Page 633)

U. S. Imports, Exports, and Reexports of Crude and Manufactured Rubber

Imports for Consumption of Crude and Manufactured Rubber

	April, 1951	
	Quantity	Value
UNMANUFACTURED, Lbs.		
Crude rubber	109,605,940	$55,238,582
Latex	13,102,956	9,604,002
Crude chicle	327,982	195,442
Guayule	408,400	183,311
Balata	814,857	241,725
Jelutong or Pontianak	192,370	180,518
Gutta percha	97,019	39,402
Synthetic rubber	2,571,110	636,534
Reclaimed rubber	39,524	2,569
Scrap rubber	5,401,929	381,499
TOTALS	132,562,087	$66,703,584
MANUFACTURED		
Tires and casings		
Auto, etc. ... no.	4,432	$97,775
Bicycle ... no.	3,015	3,481
Inner tubes: auto, etc. no.	3,014	3,968
Rubber footwear		
Boots ... prs.	5,940	26,279
Shoes and overshoes prs.	9,596	4,590
Rubber-soled canvas shoes ... prs.	7,579	5,488
Athletic balls: golf ... no.	42,888	10,636
Tennis ... no.	39,544	9,922
Other ... no.	607,084	46,891
Rubber toys, except balloons	......	26,413
Hard rubber goods		
Combs ... no.	206,304	18,516
Other	......	58,823
Rubberized printing blankets ... lbs.	175	476
Rubber and cotton packing ... lbs.	3,373	7,540
Gaskets and valve packing	......	3,442
Insulators, molded	......	6
Belting ... lbs.	9,563	11,939
Hose and tubing	......	6,906
Drug sundries	......	13,316
Nipples and pacifiers ... gross	1,700	2,115
Instruments ... doz.	3,787	6,637
Other rubber products	......	345
Golf ball centers	......	1,005
Gutta percha manufactures ... lbs.	75	105
Rubber heels and soles lbs.	356	374
Bands ... lbs.	10,953	11,072
Synthetic rubber products	......	283
Other soft rubber goods	......	229,273
TOTALS	......	$605,616
GRAND TOTALS	......	$67,309,200

Exports of Domestic Merchandise

	April, 1951	
	Quantity	Value
UNMANUFACTURED, Lbs.		
Chicle and chewing gum bases	352,431	$149,503
Balata	2,940	9,191
Synthetic rubbers		
GR-S types	8,000	1,920
Neoprene	962,003	389,986
Nitrile types	271,101	145,409
"Thiokol"	3,333	1,753
Polyisobutylene	62,597	23,678
Other, except butyl	4,212	11,947
Reclaimed rubber	3,131,191	290,072
Scrap rubber	5,881,808	441,808
TOTALS	10,679,616	$1,465,267
MANUFACTURED		
Rubber cement ... gals.	108,878	237,918
Rubberized fabric		
Auto cloth ... sq. yds.	15,202	19,557
Piece goods and hospital sheeting ... sq. yds.	123,527	77,509
Rubber footwear		
Boots ... prs.	7,351	35,479
Shoes ... prs.	7,805	9,846
Rubber-soled canvas shoes ... prs.	22,447	49,861
Soles ... doz. prs.	27,442	114,062
Heels ... doz. prs.	63,937	81,757
Soling and toplift sheets ... lbs.	275,027	72,997
Gloves and mittens ... doz. prs.	19,722	85,098
Drug sundries		
Syringes and hot water bottles ... no.	19,738	13,251
Other	......	258,668
And rubberized clothing	......	214,820
Toy and novelty balloons	......	22,155
Erasers, except pencil ... lbs.	25,918	21,588
Hard rubber goods		
Battery boxes ... no.	22,668	45,847
Other electrical goods ... lbs.	103,452	59,891
Combs, finished ... doz.	3,596	5,660
Other	......	15,714
Tires and casings		
Truck and bus ... no.	52,872	2,948,551
Auto ... no.	53,466	876,235
Aircraft	......	108,306
Farm tractor, etc. ... no.	3,611	173,001
Other off-the-road ... no.	5,970	80,360
Bicycle ... no.	9,012	17,315
Motorcycle ... no.	385	3,681
Other ... no.	2,264	50,375
Inner tubes: auto ... no.	32,481	$64,548
Truck and bus ... no.	30,261	140,121
Aircraft ... no.	1,180	10,824
Other ... no.	9,642	45,093
Solid tires: truck and industrial ... no.	1,332	32,600
Tire repair materials		
Camelback ... lbs.	396,519	143,775
Other ... lbs.	331,854	316,215
Rubber and friction tape ... lbs.	50,870	45,183
Belting: auto and home ... lbs.	103,323	144,709
Transmission		
V-belts ... lbs.	123,941	271,681
Flat belts ... lbs.	27,841	50,799
Other ... lbs.	42,909	61,943
Conveyer and levitator ... lbs.	52,581	59,406
Other ... lbs.	52	151
Hose and tubing ... lbs.	614,616	504,674
Packing ... lbs.	157,146	217,877
Mats, flooring, tiling lbs.	669,338	191,138
Thread: bare ... lbs.	49,435	109,744
Textile covered ... lbs.	28,388	101,276
Gutta percha manufactures ... lbs.	1,620	3,774
Compounded latex and rubber for further manufacture ... lbs.	453,296	235,843
Other natural and synthetic rubber manufactures	......	543,918
TOTALS	......	$10,794,794
GRAND TOTALS, ALL RUBBER EXPORTS	......	$12,260,061

Reexports of Foreign Merchandise

	Quantity	Value
UNMANUFACTURED, Lbs.		
Crude rubber	413,492	$302,036
Balata	32,259	19,283
Scrap rubber	61,860	4,641
TOTALS	507,611	$325,960
MANUFACTURED		
Drug sundries, except syringes and hot water bottles	......	$289
Rubber and rubberized clothing	......	165
Toys and balls, except balloons	......	2,353
Tires and casings		
Truck and bus ... no.	23	575
Inner tubes ... no.	269	1,262
Belting, transmission V-type ... lbs.	215	2,680
Other natural and synthetic rubber manufactures	......	490
TOTALS	......	$7,814
GRAND TOTALS, ALL RUBBER REEXPORTS	......	$333,774

SOURCE: Bureau of Census, United States Department of Commerce, Washington, D. C.

Estimated Automotive Pneumatic Casings and Tube Shipments, Production, Inventory, May, April, 1951; First Five Months, 1951, 1950

	May, 1951	% of Change from Preceding Month	April, 1951	First Five Months, 1951	First Five Months, 1950
Passenger Casings					
Shipments					
Original equipment	2,177,307		2,233,598	12,729,492	13,500,657
Replacement	3,102,245		2,604,893	13,693,853	15,754,948
Export	58,433		33,098	246,253	225,015
TOTAL	5,337,985	+9.57	4,871,589	26,669,598	29,480,620
Production	5,588,198	+9.40	5,108,248	26,125,909	31,263,495
Inventory end of month	2,506,908	+11.18	2,254,915	2,506,908	10,363,494
Truck and Bus Casings					
Shipments					
Original equipment	514,504		521,326	2,375,420	1,760,256
Replacement	808,707		807,586	3,990,696	3,309,222
Export	68,474		54,867	319,883	330,476
TOTAL	1,391,685	+0.57	1,383,779	6,685,999	5,399,954
Production	1,527,975	+6.71	1,431,880	6,874,865	5,704,228
Inventory end of month	935,459	+18.15	791,736	935,459	2,003,831
Total Automotive Casings					
Shipments					
Original equipment	2,691,811		2,754,924	15,104,912	15,260,913
Replacement	3,910,952		3,412,479	17,684,549	19,064,170
Export	126,907		87,965	566,136	555,491
TOTAL	6,729,670	+7.58	6,255,368	33,355,597	34,880,574
Production	7,116,173	+8.81	6,540,128	33,000,774	36,967,723
Inventory end of month	3,442,367	+12.99	3,046,651	3,442,367	12,367,325
Passenger and Truck and Bus Tubes					
Shipments					
Original equipment	2,692,215		2,757,532	15,114,365	15,255,090
Replacement	2,823,043		2,786,958	14,833,710	14,191,516
Export	69,765		48,093	327,922	296,096
TOTAL	5,585,023	—0.14	5,592,583	30,275,997	29,742,702
Production	5,624,875	+1.06	5,565,700	28,112,676	30,878,779
Inventory end of month	5,070,531	+8.88	4,656,998	5,070,531	12,109,933

NOTE: Cumulative data on this report include adjustments made in prior months.
SOURCE: The Rubber Manufacturers Association, Inc., New York, N. Y.

Compounding Ingredients—Price Changes and Additions

Accelerator-Activators, Organic

Emersol 110	lb.	$0.1425	/ $0.155
120	lb.	.1475	/ .16
130	lb.	.17	/ .1825
210 Elaine	lb.	.1475	/ .175
Emery 600	lb.	.13	/ .1575
Hyfac 430	lb.	.1775	/ .19
431	lb.	.1875	/ .20

Carbon Blacks

(FEF) Sterling SO	lb.	.06	/ .10
(HAF) Vulcan #3	lb.	.079	/ .122
(SRF) Gastex	lb.	.045	/ .085

Chemical Stabilizers

Dutch Boy DS-207	lb.	.54	/ .56

Latex Ingredients

Aquablaks	lb.	.0725	/ .1875

CLASSIFIED ADVERTISEMENTS

Continued

MACHINERY AND SUPPLIES FOR SALE

(*Classified Advertisements Continued on Page 634*)

RUBBER HARDNESS

THE LANGUAGE OF THE RUBBER INDUSTRY SINCE 1915

DUROMETER

VARIOUS MODELS FOR TESTING THE ENTIRE RANGE

TECHNICAL DATA ON REQUEST

THE SHORE INSTRUMENT & MFG. CO., INC.

90-35 VAN WYCK EXPRESSWAY
JAMAICA 2, N. Y.

WANTED

Financially responsible organization will purchase complete sponge and mechanical rubber goods plant with presses, calenders, mills and extruders. Will consider all offers. Please give complete details first letter.

Address Box 555,
c/o INDIA RUBBER WORLD

CUSTOM MIXING

We do milling and compounding of all types — blacks or colors — Master Batches —
All mixing done under careful supervision and laboratory control.

PEQUANOC RUBBER CO.

Phone: Butler 9-0400 BUTLER, NEW JERSEY

BOUGHT — SOLD

Glycols — Cellosolves — Ethanolamines — Titaniums
Zinc Oxide—Dyes—Colors—Chlorinated Solvents
Zinc, Nickel, Cadmium Metals and Chemicals

CHEMICAL SERVICE CORPORATION

80 Beaver St., New York 5 HAnover 2-6970

CLASSIFIED ADVERTISEMENTS

Continued

MACHINERY AND SUPPLIES FOR SALE (Continued)

FOR SALE: JACKETED VULCANIZER 16 FT. LONG BY 5 FT. dia. Quick-opening doors. Also 40-in. vulcanizer with 48-in. bolted door. One 4½-in. extruder with motor and drive. Address Box No. 856, care of INDIA RUBBER WORLD.

FOR SALE: SIX-OPENING PRESS 24 IN. X 54 IN. X 3 IN. platens, two 11-in. dia. rams. Also 40-in. mill with 50 h.p. motor and silent chain drive. Address Box No. 857, care of INDIA RUBBER WORLD.

MACHINERY AND SUPPLIES WANTED

RUBBER MANUFACTURER IN EASTERN PENNSYLVANIA would like to purchase a vulcanizer in good operating condition, approximately 40″ opening by 30″ deep. Address Box No. 843, care of INDIA RUBBER WORLD.

WE ARE INTERESTED IN PURCHASING TWO 60″ MILLS IN good condition with or without motors. Write Box No. 844, care of INDIA RUBBER WORLD, what you have to offer.

STOCK CUTTER FOR EXTRUDED AND FLAT STOCKS. PREfer Utility, Black Rock, Thropp, Rotary, or Ferriot. Also stock storage racks. RADIATOR SPECIALTY CO., P. O. Box 1109, Charlotte, N. C.

BUSINESS OPPORTUNITIES

OPEN TIME FOR GRINDING AND PULVERIZING OF MANY friable plastic resins and scrap to your specifications. Phone New Haven 8-6151. ELM CITY RUBBER CO., Box 1864, New Haven, Conn.

AVAILABLE FOR IMMEDIATE SALE 1,000 LBS. NEOPRENE CG old stock. Can be used for neoprene mechanical goods items. Address Box No. 842, care of INDIA RUBBER WORLD.

RUBBER AND GR-S MIXING, COMPOUNDING, AND CALENDERing. All work done under careful supervision. Contract work invited. Phone New Haven 8-6151. ELM CITY RUBBER CO., Box 1864, New Haven, Conn.

COMPLETE TOY BALLOON PLANT FOR SALE. Equipment less than three years old. Address Box No. 851, care of INDIA RUBBER WORLD.

MIXING AND MASTICATION CAPACITY AVAILABLE to customers' specifications on No. 3A Banbury Type Machine. We are manufacturers of Molded, Lathe Cut, and Extruded Soft Rubber Goods and have surplus mixing capacity.

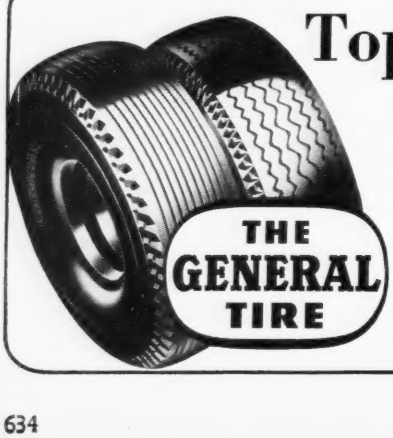
MARTIN RUBBER COMPANY

Long Branch Ave., Long Branch, N. J.
Telephones: Long Branch 6-1221-1222

MANUFACTURING BUSINESS WANTED

We are now manufacturing over $20,000,000 in various lines and wish to expand by acquisition of assets or stock of one or more industrial companies. In our negotiations the sellers' problems and wishes will receive full consideration. Present personnel will normally be retained.
Address all replies "confidentially" C. J. GALE, Sec., 233 Broadway, New York 7, N. Y. BArclay 7-1819.

Top-Quality that never varies!



THE GENERAL TIRE & RUBBER COMPANY
AKRON, OHIO

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BAYTOWN, TEXAS • BARNESVILLE, GA. • PASADENA, CAL.
JEANNETTE, PA.

Associated Factories:

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UNION OF SOUTH AFRICA

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